ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

Vol. 8. No. 20. WEEKLY. | NEW YORK, SATURDAY, JULY 17, 1886. | $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

Telephoning from New York to Philadelphia.

DESCRIPTION OF THE SWITCHBOARD SYSTEM OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

The REVIEW presents to its readers in this issue a complete illustrated description of the new switchboard system for metallic circuits and single lines adopted by the American Telephone and Telegraph Company in its work of giving instantaneous and satisfactory verbal communication between cities. This system of switchboards, line connections, cable-house arrangements, etc., a portion of which appeared in our last edition, is the invention of Mr. T. B. Doolittle, of the American Bell Telephone Company. Every telephone man of practical experience can realize the apparently insurmountable difficulties that had to be overcome to secure perfect communication, irrespective of ordinary and even extraordinary accidents and exigencies. This Mr. Doolittle has accomplished. The tests that have been made now show a splendidly working line between New York and Philadelphia; and when the connections are made in the latter city, this same degree of excellence, will, no doubt, extend to the entire system.

The detail of the work shows that it has been the aim of the inventor to provide a system for general telephone use, which is capable of extension to an unlimited extent without material change, *i. e.*, added to or taken from, according to the requirements of the business, by a system of units. The advantage of such a system will be apparent to any mechanic of experience, inasmuch as it not only furnishes a systematic method for extending mechanical facilities of the business, but also an economical and systematic method of manufacture.

The combination of the annunciator drop and spring-jack in one frame reduce the central office apparatus to the same plane with the telephone transmitter, magneto bell, etc., that is to say, to increase a plant one or more subscribers, we would simply add to the order for said instruments a corresponding number of annunciator drops. These drops are so constructed as to be adaptable to either cross connections for interconnection in the same exchange, or for single lines, or for metallic circuits; a simple change in the connection cuts out or leaves in the resistance of the coil as may be desired, and the socket is adapted to receive either a metallic circuit or single line plug. Immediately under the socket is located the annunciator drop, which enables the operator to close the shutter in one and the same motion which inserts the plug, reducing very materially the time required for making a connection between subscribers.

The connecting posts are provided with square shanks passing through square hard rubber insulation, which prevents turning, and are also adapted to receive a screw socket which may be removed or replaced at will.

The whole device is made in a strong and substantial manner, calculated to withstand the hard usage to which central office apparatus is necessarily subjected.

The table is provided with shelves for additional drops as the business may require. The space being filled with blank wood strips, which may be reduced in proportion as the drops are added.

The double switches for cutting in or out of the telephone, are provided with shanks which pass through brass bushings set in the table, and are held in contact by spiral springs made from best quality of piano wire. This arrangement compensates for the wear and has been proved by long continued use to be perfectly reliable. The flexible cords are made of extra conductivity and of the strongest and most durable material. Each table is provided with a repeating coil adapted to connect metallic circuits with single lines.

Switchboards, which are to be located at intermediate points, as for instance, at Provi-

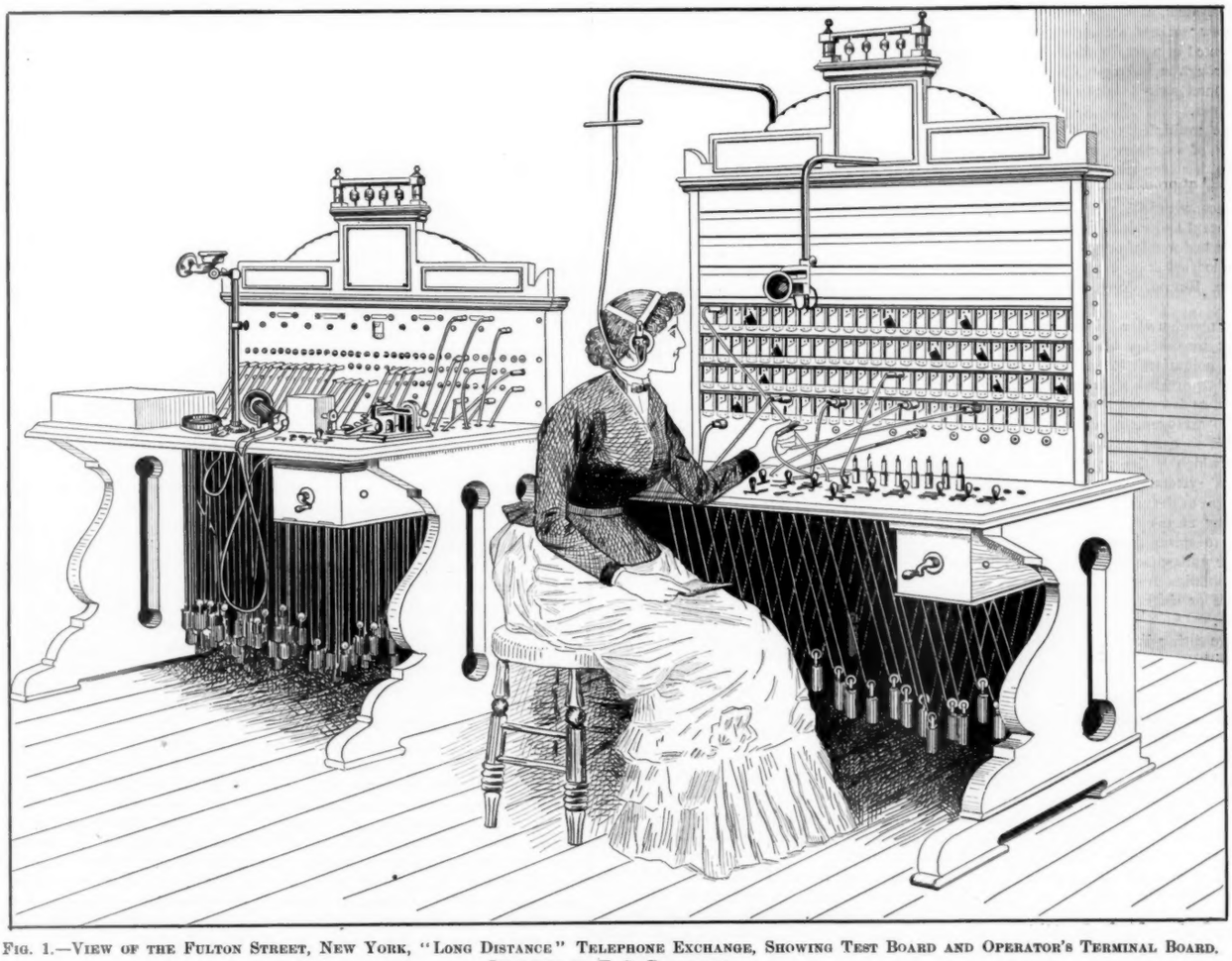


FIG. 1.—VIEW OF THE FULTON STREET, NEW YORK, "LONG DISTANCE" TELEPHONE EXCHANGE, SHOWING TEST BOARD AND OPERATOR'S TERMINAL BOARD. INVENTED BY T. B. DOOLITTLE.

dence, as between Boston and New York, are provided with conducting cords, weights and plugs, which are the terminals for incoming lines, and located preferably on the back side of the switchboard. Said plugs are inserted in the screw sockets heretofore referred to, and are for the purpose of making quick changes in the location of the wires in order to make up metallic circuits from a number of wires which may be free from trouble after an accident to the line, or substituting good wires for bad ones. This feature of the system is certainly new and exceedingly valuable.

This arrangement also enables the operator to change the wires quickly from metallic circuits to single lines, and *vice versa* as occasion may require, as for instance, lines running to minor points, which may be used for both metallic circuit or single lines, for through or local business. As these lines will be subjected to change in location and numbers, celluloid discs are inlaid opposite each wire, upon which are to be written with pencil the numbers ofthe wires. If change is made the number may be quickly erased and a new one substituted. All the numbers and letters which designate the wires, are stamped upon metal tags kept in place by the screws which hold the drops in position, so that in case of trouble in a drop from any cause, said drop may be replaced by another, and the tag attached to the new drop and remain to indicate the same as before. The drop in trouble may be repaired and replaced in the system, at any point desired.

Screw sockets are provided, which are connected in pairs for the purpose of making up through metallic circuits or single lines. A ground strip is also provided for testing purposes.

The multiplicity of styles and arrangements of switching apparatus in different places, has been taken into account, and our readers will note the adaptability of this to connect with all other systems—quite an important and valuable feature.

The test or chief operator board is intended to be located at prominent points, as for example, Boston, New York, Philadelphia, etc.

All tests between said points will be made direct to the test boards, and, for intermediate points will be made with the switchboards provided with the switch cords and plugs, as described above.

The arrangement of the testboard is intended to carry out the principle of expansion which is the prevailing feature of the entire system. The incoming lines are brought to the screw cups on the back side, and by means of switch and cords are carried to spring jacks in front of the table. These spring-jacks are connected with the combination drops by wires in the form of cables or singly, as circumstances may require.

Two spring-jacks are connected with each combination drop, which is intended to be used for metallic circuit, and the wires numbered from 1 consecutively.

The odd numbers in all cases will be *A* of the metallic circuit, and the even numbers will be *B*. Therefore, for example, should a certain number be called for, say 25, it is known that 25 is *A* of the pair used for metallic circuit, and 26 is *B* of the same circuit; therefore, there can be no confusion in the pairs belonging together. The same system will be carried to the pole lines and the wires will be known as 1*a*, 2*b*, 3*a*, 4*b*, 5*a*, 6*b*, etc.

The test board is provided with a rheostat and galvanometer. The unknown resistance is carried to the upper left-hand corner and terminates in spring-jacks. Any line which requires to be tested is plugged into one of the pair of jacks and a ground plug inserted into the other. In the center of the table is placed a telephone set terminating in spring-jack, as described in the case of the galvanometer. The telephone set is provided with a double switch for cutting out or in, also with an annunciator drop.

At the right is a Morse set arranged as described above, provided with a double switch for cutting out or in the main battery. To reverse the battery we have only to transpose the position of the plugs in the spring-jacks.

Referring to the engraving, Fig. 1, a view is given of the New York office, 140 Fulton street, showing the test board as above described, and terminal operator's board, indicated by the presence of an operator. The improved long distance transmitter, which the intelligent work and genius of E. T. Gilliland has brought to its present recognized perfection, is shown on each board. Fig. 2 is a sectional end view of the intermediate board, to be located at smaller stations between the larger cities. The special advantages of this arrangement consists in the promptness with which one wire may be substituted for another, for example: One of the lines of a double wire circuit may be out of order between one of the terminal stations and the first intermediate station, and it becomes necessary, to prevent a stoppage of the business, to throw the disabled portion out of circuit altogether and to substitute a perfect wire in the main line be.

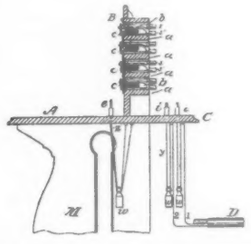


FIG. 2.—END VIEW OF INTERMEDIATE TELEPHONE SWITCHBOARD, SHOWING FRONT AND REAR CONNECTIONS.

tween the two said stations. One of the local lines may be temporarily used for this purpose, and the circuit manager at the principal station will first make the change himself and then give the order to the operator at the intermediate station. The lines are in practice all designated with a special number, and are so marked; and it is for the dispatch of business desirable that an order couched in some concise terms—such as "disconnect No. 1 east and connect No. 9 east in its place"—shall be at once understood and instantly complied with.

In accordance with the above, this device consists in embodying in a single electric switchboard connecting cords and plugs placed at one side of the switchboard, each representing a single-line terminal, annunciators and connecting devices, each provided with one or more sockets for the protection of the said line-terminal plugs, and a series of

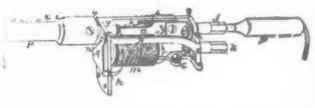


FIG. 4.—VIEW OF COMBINATION SPRING JACK AND ANNUNCIATOR.

pairs of conducting cords and plug connectors arranged upon the other side of the switchboard, and adapted to be used for connecting any two lines together for connection.

In the drawings, *A* is the table, and *B* the vertical portion of a switchboard supported upon suitable standards *M*. The table or horizontal front-board is continued to the rear of the vertical portion by a shelf *C*, which is perforated with holes for the line-terminal cords to pass. A series of terminal plugs *i* rest by the handle ends upon the shelf *C*, over the holes, through which the cords *y*, each constituting a single-line terminal, pass. These cords are maintained in place by weights *w*, and are electrically connected with the entering lines 1, 2, etc., which, as shown, may be brought into the office by means of a cable *D*, or in other preferred manner. The ends of the plugs *i* are of metal, with screw ends, tapering toward the extremity. A series of shelves *a* are fixed across the upper or vertical part *B* of the switchboard, and support each a number of combined annunciators and spring-jacks *b*, each of which is provided with screw sockets *s s'*, for the insertion of the screw ends *i*.

Fig. 3 exemplifies the details of the connection between the test-board and operator's board both shown in Fig. 1. The lines *L* are the incoming wires, *L'* and L^2 being supposed to be the two wires of a metallic circuit, other lines, *L*, being single wires. Each separate wire terminates at the board *A* in a flexible cord *v*, kept in position by the weight *W*, and provided with a solid metal connecting-plug, *P*. The metal plug-sockets *s*, placed above, each connect with an annunciator and spring-jack on the board *B*. Those of the annunciators *a* and spring-jacks *q* that are intended for metallic circuits are placed in loops from the boards *A*. The two wires *z* and *z'*, for example, constitute such a loop to the extreme right-hand annunciator *a*, *y* and *y'*, forming another to the next, and so on. The wires *x* and *w*, on the other hand, being adapted for single-line circuits, each extends to a separate annunciator and jack, the other side of which connects with a wire *g*, leading to earth at *G*. By this construction the two wires of a metallic circuit, *L'* and L^2, may be at will connected with any of the loop-annunciators on the board *B* by inserting the two plugs forming the ends of such wires into the two sockets representing the annunciator desired. Moreover, if one of the wires—say L^2—of this specific circuit be disabled, any other de-

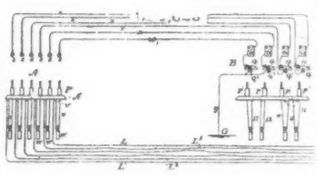


FIG. 3.—SHOWING METHOD OF CONNECTING OPERATOR'S BOARD AND TEST BOARD.

sired wire may be substituted therefor, until repairs be completed, by withdrawing the plug of L^2 from its socket, and inserting in lieu thereof the patching line—say L^5.

Fig. 4 is a reduced engraving of the combination spring-jack and annunciator drop, with both the line and connecting plug inserted. If it is desired to use the instrument on a single ground return-line, the plug *p* forming the terminal of that line is inserted in socket *j*, and a connection to earth is placed in *k*. If it is desired to place the instrument upon a metallic circuit, the plugs *p* forming the terminals of the direct and return conductor, respectively, are placed in the sockets *j* and *k*. The benefit derived from this arrangement will be seen when, for instance, one side of the metallic circuit is broken or becomes in any way defective, the defective portion may be readily removed by withdrawing its plug, and another wire may be substituted by inserting the proper plug.

The American Telephone and Telegraph Company has for its president Mr. Theo. N. Vail, so prominently connected with the success of the American Bell Telephone Company, and its general manager is Mr. E. J. Hall, Jr., a thoroughly able and devoted worker in this great enterprise. With these gentlemen of unquestioned business ability and sagacity at its head, with their scientific and expert staff, there is no probability that the enterprise will become other than a pronounced commercial as well as scientific success. When once the service is ready—apparently only a matter of a few weeks—let the public be made aware of the vast improvements which are found in this new metallic circuit system over the former work in this direction, and we predict that the company will find a service demand created that will soon require an extension of their present apparently comprehensive facilities. The American Bell Company in organizing and carrying forward this work at an immense outlay deserves great credit—credit that is not usually accorded to "soulless monopolies," no more than such ventures into comparatively untried fields are usually their work in times of depression.

The Relative Value of Iron and Copper Wire.

Mr. W. H. Preece recently read a paper before the British Association, in which he discussed the results of experiments made to determine this question. His conclusions indicate a wide market for copper. Copper, he says, is gradually replacing iron for aerial telegraphs, owing to its greater durability in the atmosphere, but its greater cost has led to the use of smaller-sized wires. This can be done without detriment to the economy of the line, for the resistance of copper, as compared with iron, varies very nearly inversely as its price per ton, and hence the cost per mile remains about the same. It will be observed that copper shows a very decided superiority over iron, the speeds being as follows:

	Copper.	Iron.
Simplex working	414	345 words per min
Duplex "	270	237 " "

It is anticipated that the superiority of copper over iron indicated by these experiments will have a beneficial and economical influence on the telegraph system, and that its extended use will enable us not only to work better, but to dispense with intermediate repeaters in many cases where, on long lines, they are now necessary. The most interesting point, however, in connection with these experiments is that they apparently prove that the superiority of copper is not simply due to its smaller electrostatic capacity and resistance, but that it is more susceptible to rapid changes of electric currents than iron; for when the resistance and capacity of the copper and iron wires were equalized by the insertion of resistance coils and condensers, the speed on the former was not thereby diminished. Possibly the magnetic susceptibility of the iron is the cause of this. The magnetization of the iron acts as a kind of drag on the currents. It is well known that telephones always work better on copper than on iron wires, doubtless for the same reasons.

A Great Telegraphing Feat.

An Englishman after having shown the operations of the pneumatic tube for carrying parcels in New York, said: "I have seen just one thing more wonderful than that," said the visitor. "I have talked by cable from London to Calcutta, India, over 7,000 miles of wire. Two years ago I called upon Managing Director W. Andrews, of the Indo-European Telegraph Company, at No. 18 Old Broad street, London. It was Sunday evening, and the wires were not busy. Mr. Andrews called up Emden, a German town. 'Give me Odessa,' he wired, in a few seconds we got the signal from the Russian seaport city, and asked for Teheran, the capitol of Persia. 'Call Kurrachee,' said Andrews. In less than half a minute we were signaling that India town. The signals came at the rate of fifteen words a minute. After learning that the London office was testing the long wires, Kurrachee gave us Agra, and we chatted pleasantly for a few minutes with the operator on duty there. In a short time the operator switched us on the cable to the Indian capital Calcutta. At first the operator there could not believe he was talking to London, and he asked in the Morse language: 'Is this really London, England?' It was a wonderful achievement. Metallic communication between the capital of the English nation and the seat of her government in India, 7,000 miles away as the bird flies."—*New Orleans Times Democrat.*

* * A voltaic cell recently devised in England is claimed to be worthy of being considered a constant cell. It consists of a cadmium plate and a platinum plate, the exciting solution being of cadmium iodide with free iodine in it. The cadmium plate was however, revolved in the solution by clock work at the rate of two or three revolutions per second. The electromotive force of the combination was about 1.076 volts. This is a convenient value for practical purposes, as it is almost 1 volt. The movement of the plate appears to keep the electromotive force more constant, although the cell has been supplying a current, than if the plate had been kept still.

Transformation of Heat Energy Into Electric Energy.

It may be generally stated that the transformation of energy from one form to another is always accompanied by loss; not actual loss, but a relative loss between the form of energy expended and that realized; the difference being evolved as heat.

Thus, in generating electricity by means of the dynamo electric machine, we must consume fuel, vaporize water, drive a steam engine, which in turn actuates the dynamo. The loss between the heat units expended and the electric units realized is enormous. Where wind or water power is used as the prime mover the loss is not as great.

Thus it will be seen that the less number of forms energy has to assume before reaching the particular kind which it is desired to obtain, the smaller will be the percentage of loss.

In converting heat units into electric units the greatest economy would of course be obtained, could we generate the desired currents by the simple combustion of the fuel.

Scientific men all over the world have been working for years to obtain this result; but so far, nothing has been accomplished, although enough has been done to demonstrate its entire practicability, and the feeling grows stronger day by day that it is only a question of time when the desired results will be obtained, and that heat and electricity are very closely related.

So far as the present knowledge of the subject is concerned, we know that in a Thermopile made from two dissimilar metals, if the point of contact of the metals be heated a current will flow, and which will continue until the temperature of the metals is raised to a definite amount, differing with dissimilar pairs of metals, and seeming having regard for the specific heat of the dissimilar metals. The currents derived from the Thermopile are very feeble and of short duration, as the limit of temperature is soon reached. Various devices have been suggested for radiating or carrying off the heat of the couple, but no one device has yet been made which will give a fair out-put, or anything approximating to an economical return for the heat energy expended. Various experiments have also been made, having in view the generation of currents by means of chemical combinations at high temperatures.

Promising results have been obtained, but principally for mechanical reasons a practicable device has not yet appeared.

Anything showing an advancement towards economical conversion of heat into electric energy is of great scientific interest, and in this connection the following description of an alleged new method and apparatus for converting heat into electric energy, and patented * by W. E. Case, of Auburn, N. Y., is given space:

The principle of Mr. Case's device, to use his own language, may be stated to be: "To cause a direct supply of heat to affect a combination of bodies, liquid and solid, of certain composition, in which combination at normal temperature no chemical reactions occur, by reason of the bringing together of the constituents, and hence, which under such conditions will not generate an electrical current, but in which when heat is applied, as aforesaid, chemical energy will be developed and an electrical current be produced. The electrical energy so yielded is within certain limits correlated to the heat supplied, and depends, first, upon the elevation of the liquid to a certain temperature in the presence of the other constituents to a certain degree of temperature, and, second, upon the maintenance of the heat supply.

Referring to the cut, which is a sectional view of the apparatus employed, *A* is a containing vessel which is closed hermetically by the cover *B*.

C is a plate preferably of carbon, which rests upon the bottom of the vessel *A*. Connected with this plate is a rod *D* of conducting material, which is covered with rubber or other suitable insulating substance *E*. This rod extends through the cover *B* and communicates with a binding screw *F*, to which one of the circuit wires is attached; upon the plate *C* is placed a quantity of metallic tin, and being in contact with the plate, makes electrical connection with it.

G is a plate of carbon which is surrounded with an envelope, *H*, of porous non-conducting material, such as baked porous clay or pottery. Connected to the plate *G* is a rod *I* of conducting material surrounded with insulating material *J* above said plate. The rod *I* passes through the cover *B*, and to it is connected the binding screw *K*, to which the other circuit wire is connected.

In the vessel *A*, and surrounding the plates, is placed a solution of chromic chloride. This solution is prepared according to a known process of heating together chromic acid, hydrochloric acid, and alcohol.

Mr. Case alleges that an apparatus thus constructed at normal temperature gives substantially no electrical current—that is, if it yields any current at all the same is very small, and is probably unavoidably due to impurities in the tin or liquid. With chemically-pure materials it should, however, yield no current at all. On applying heat to the containing vessel, and so raising the temperature of the liquid, a current becomes manifest, and, as the result of experiment, he finds that the galvanometer indications obtained are approximately as follows: On heating the cell to 120° Fahr. the galvanometer deflection is two degrees.

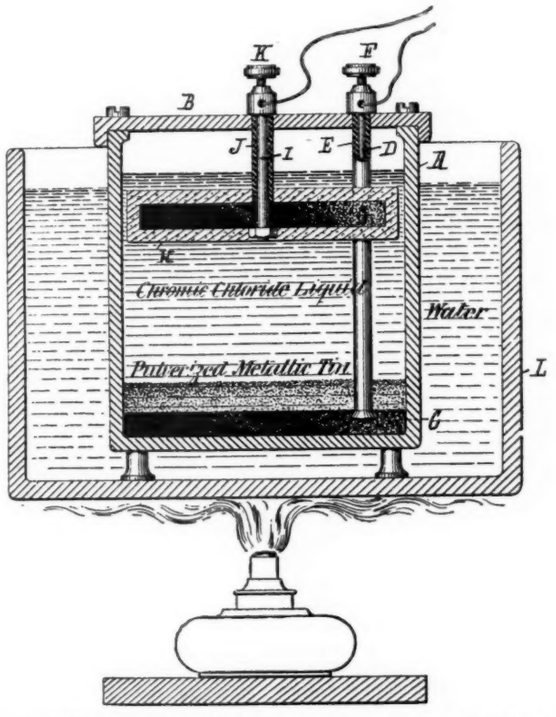
THE FOLLOWING TABLE SHOWS THE DEFLECTIONS AS THE HEAT AUGMENTS.

120° Fahr.	=	2°	Galv. Deflection
130° "	=	4°	" "
140° "	=	8°	" "
150° "	=	13°	" "
160° "	=	17°	" "
170° "	=	29°	" "
*180° "	=	28°	" "
190° "	=	34°	" "
200° "	=	44°	" "
207° "	=	49°	" "
212° "	=	49°	" "

The elevation of temperature should, however, not be carried above 212° Fahr., the maximum being obtained at about 207°.

In order to prevent the heat exceeding 212°, the open tank *L* is employed containing water, in which the vessel *A* is placed. Beneath the tank is placed a lamp or other convenient source of heat. The tank being open to the atmosphere, the water remains at the normal boiling point, which, under ordinary conditions, as well known, is about 212° Fahr. In this way overheating of the apparatus is prevented. The immediate effect of the elevation of temperature, Mr. Case states, is to decompose the chromic chloride in the presence of the tin into free chlorine and chromium protochloride. The chlorine then combines with the pulverized metallic tin to form tin protochloride, and, as a consequence of this reaction, an electrical current is established through the liquid and between the metallic tin as one electrode and the carbon plate *G* as the other electrode. The carbon plate *C* is not itself an electrode, but serves simply as a conductor in contact with the tin to lead the current to the circuit terminal. The heat being maintained, the current continues to flow until all the tin is converted into protochloride. The apparatus is then spent or exhausted, all chemical affinities rendered active by the application of heat being satisfied. The apparatus may now be regenerated from its present inert state simply by abstracting heat. This is accomplished by removing the lamp or other source of heat, and in addition, if desired, taking the vessel *A* out of the hot water and placing it in a cooling medium. As the liquid cools, the tin protochloride and chromium protochloride react. The chlorine from the tin protochloride goes over to the chromium protochloride, forming chromic chloride, and metallic tin is deposited. This tin falls by gravity upon the carbon plate *C*, and, by the time the liquid has been cooled down to normal temperature, the condition of the apparatus is the same as it was in the beginning, so that it is simply necessary again to apply heat to cause a current to be generated. The object of the porous non-conducting envelope around the carbon plate *G* is only to prevent any possible deposition of tin thereon.

In lieu of placing the tin on the apparatus in a comminuted state, it may be inserted in a solid state. The reactions will be the same as already described, and when the apparatus is regenerated the tin will be deposited in pulverulent form. So, also, instead of directly putting in metallic tin, the liquid may be formed of tin protochloride and chromium protochloride, which immediately on mingling at normal temperature will deposit the tin, and the remaining liquid will be chromic chloride.



APPARATUS FOR CONVERTING HEAT INTO ELECTRICAL ENERGY, BY W. E. CASE.

It will be apparent that it is unnecessary, in order to maintain the apparatus in efficiency as a producer of electricity, to replenish the contents, but that all that is required is to heat the apparatus, as above described, to cause it to yield a current; then when the current ceases, to cool it, and then to reapply the heat, and so on indefinitely.

No data is given of approximate economy of the conversion as effected by the device.

[The table of galvanometer deflections for increase of temperature would seem to show that, as in the case of the metals of the Thermopile, there is a limit of temperature, and that the generation of electricity continues only so long as there is a difference of temperature between the metals of the Thermopile, or that the chemical affinities of the bodies in Mr. Case's apparatus remained unsatisfied. Carrying the analogy further, the Thermopile is after cooling again ready for work. In Mr. Case's device extraction of the heat breaks up the chemical relation established, and the bodies return to their original condition, and are again ready to unite and generate current as before.—ED. REVIEW.]

*The numbers of the patents are:
344,345,
344,346, } June 29, 1886.
344,347,

*Not explained.

Some Figures for the Telephone Subscribers Benefit.

A writer in one of our daily papers gives a history of the Chicago Telephone Company, as far as he can guess and wonder. The writer is one of that unfortunate class who sees some one else prosperous, and is mad because he is not; *ergo*, anything he could do to decry the enterprise must be done. There is another characteristic which is the prerogative of that class of American citizens. They never see any chance for success in the infancy of just such an enterprise as the telephone, and the probability is that this individual, whoever he may be—supposing he was on earth at the time—was one of those who considered $500 too high a price to pay for the Bell patent for almost any State in the Union. Additional evidence of the wisdom of this writer is found in his methods of reasoning, when he undertakes to show that the larger the exchange the cheaper the telephones could be rented, and the more money the company would make, while he ignores the fact so well known to all telephone men that the amount of labor, and hence the expense, because of the increased spread of the system is in a sort of arithmetical progression as the exchange grows. He assumes as a basis that Chicago and vicinity have now 5,000 telephones, and that a less price, say $60 per year, would increase the list to 15,000 or 20,000 in no time."

Here is a point the gentleman has not considered. Which is worth more, a chance to select from 5,000, or from 15,000 persons? Can he buy dry goods or groceries better in a town where there are two or three dealers, or in a city where there are hundreds?

And, again, what is the proportionate expense of the two exchanges, where each may call up one of 5,000 subscribers in the one case, or one of 15,000 in the other case? In the first case, where each of 5,000 subscribers may call for any one of 4,999 stations, the number of possible calls would be the number of stations less one – the calling party—multiplied by the total number of stations:

$$4{,}990 \times 5{,}000 = 24{,}995{,}000$$

In the second case,

$$14{,}990 \times 15{,}000 = 224{,}985{,}000$$

and the difference, 199,990,000

or an addition of 10,000 lines to a reseau of 5,000 lines increases the possible connections through the exchange almost 200,000,000.

*** A telephone line is now in successful operation between Washburn, Dak., and Bismarck, a distance of 40 miles. The advantages of telephonic communication with the territorial capital will be of great benefit to the business men of Washburn.

Electrical Review.

Published at 23 Park Row.
P. O BOX 3329.

GEO. WORTHINGTON, - - - Editor.
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LOREN N. DOWNS, President.
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NEW YORK, JULY 17, 1886.

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The Bavarian Chamber of Deputies recently voted $9,000 for the construction of an electro-technical laboratory, to be connected with the Polytechnique School at Munich.

"It is a remarkable fact," says the Troy (N. Y.) *Telegram*, "that a large number of persons are becoming deaf in one ear. Has the repeated use of the telephone anything to do with the increasing deafness?" We think not, but the Troyites should use the other ear for several months and notice the effect.

In the suit of the Bankers and Merchants' against the Western Union for damages of $2,000,000, the jury has returned a verdict of $240,000. Whether the damages awarded are adequate or not, or whatever may be the merits of the general controversy between the companies, the evidence indicates that trespass was committed, and property not in dispute damaged by persons in the employ of the Western Union. The decision is unsatisfactory to both parties.

Cincinnati is given the honor of being the home of the electric brake, and it seems inclined to stay at home. Inventor Duwelius or Inventor Card, of that city, could probably give some information on this score.

Seven paper mills in New England are lighted by the incandescent system of the Mather Electric Company. These mills are rapidly realizing the superior qualities of this mode of illumination over the vitiating and heat-giving gas.

We have received a fervid communication from Dr. J. Harris Rogers, of Parthenon Heights, containing a large amount of miscellaneous matter, which we will reserve until the weather is cooler.

Mr. Ranney of the House Committee on the telephone inquiry, has rendered a minority report. The document is so evidently partizan and so clearly intended for a campaign document that we do not consider it worthy of serious consideration. According to Mr. Ranney, Mr. Garland is guilty of all the crimes of the decalogue—possibly excepting murder.

The proceedings of the National Electric Light Association at the Baltimore Convention have been been issued in pamphlet form, and comprise a volume of 222 pages filled with most interesting and valuable matter. A copy will be sent to all the members of the Association free, to all others on payment of $2 per copy.

The members of the two national electrical associations—the Electric Light Association which meets at Detroit August 31, and the Telephone Exchange Association, which meets at St. Louis September 7th—should not only attend in person their respective organizations, but if they should intermingle we are sure a warm welcome will be extended. Let all the telephone gentlemen who can visit with their electric light brethren in Detroit, and the following week will no doubt see reciprocal visitors in St. Louis. There should be more of a community of the electrical interests. There are many questions of mutual importance, and friendly discussion of them will bring better results than ever was possible before.

The very complete and interesting report of the line work of the American Telephone and Telegraph Company, which appeared last week, is supplemented in this issue of the REVIEW by a no less interesting and instructive description of the central office switchboard system that has been perfected for the use of this company. This work is a great one and will be of vast importance when fully completed.

New York police service will be improved by the addition of the proposed telephone system. The only defect in our police service is in the means of communication, and this will now be remedied. Boxes are to be put upon every beat, by which the roundsmen can communicate immediately and fully with headquarters or with any station connected with the system. An illustration of the improvement in speed over the old method is afforded by the Superintendent's statement that, whereas it now takes twenty-six hours to find a lost child, under the new system it will take about thirty minutes. The telephone has been put to fire and police use in other cities, and worked most admirably. New York should not be behind all other cities in adopting modern improvements.

HEAT ENERGY INTO ELECTRIC ENERGY.

In another column we print a description of Mr. Willard E. Case's battery for transforming heat into electric energy. The invention presents certain points of novelty which are very interesting from a scientific point of view. Whether the device is commercially practicable remains to be proved.

Mr. Case, in any event, is deserving of credit for the conscientious experimentation and study which has led up to the invention.

THE LATEST THEORY CONCERNING THE SINKING OF THE OREGON.

Just how the mishap to the Oregon occurred has not yet been discovered with certainty. The officers and owners of the steamer insist that she was run down by a schooner, because if she were lost while violating the rules—such as running at full speed in the fog—her owners would be liable for all damages.

The press generally were misled into accepting the theory advanced.

The *Scientific American* was the only journal to show the improbability, if not absurdity, of this theory. It showed by such evidence as was furnished by tide, wind, and courses, that the Oregon, instead of being the innocent victim of some careless schooner, which ran into her, bows-on, was in reality the aggressor; in fact that, running at full speed during a fog or haze, in direct violation of the law, she ran into the stern of a sailing vessel.

The first corroboration of this plausible theory came when the divers, having examined the rent in the portbow of the Oregon, discovered that it had been made by the stern of a sailing vessel.

Later on, however, at a meeting of the Clyde shipbuilders at Greenock, the report and conclusions of the Wreck Commissioners was declared to be only a whitewashing report for the purpose of absolving the owners of the ship from responsibility. After a careful consideration of the facts it was decided that a sailing vessel could not have been in the position ascribed to the strange craft by the officers of the Oregon, and they expressed their belief that the Oregon was not run into at all, but, on the contrary, ran into the stern of a sailing vessel while running at full speed during thick weather in direct violation of the law.

The article in the *Scientific American*, which has thus been sustained by the highest nautical authorities, was written by Mr. Franklin H. North, whose early life was passed as an officer in the United States Coast Survey. Mr. North is a graduate of the ELECTRICAL REVIEW, of which he was the associate editor for several years, writing the leading scientific articles. He is a young gentleman of scholarly attainments and literary ability of more than ordinary promise.

AN ELECTRICAL BALLOON.

Dr. A. De Bausset, who, as his name indicates, is a French gentleman, has invented—and is doing his best to enlist capital in his enterprise—a novel species of balloon, in which the buoyant power will be superior to that of hydrogen.

The Doctor's idea is, to say the least, original, so far as is known here, and consists in the use of a huge cylinder of plate steel, one-forty-fourth of an inch thick, arranged in several air-tight compartments, with peculiar shaped joinings, enabling the whole to withstand the requisite pressure from without.

This cylinder is to be six hundred feet in length, by one hundred feet diameter, pointed at the extremities. The specific weight of the atmosphere at sea level is about two and two-thirds pounds per cubic yard. The capacity of the cylinder then would be in round numbers say 500,000, and its lifting power 815,000 pounds.

Allowing for the weight of the apparatus and its impedimenta and the use of only a partial vacuum, the inventor calculates on having a useful carrying capacity of 150 tons.

Of course electricity is an essential part of the invention. By mean of dynamo power he will exhaust the air from his cylinder, proportioning this to his needs, rising and lowering through the atmosphere at will, and by means of his propeller wheel moving backwards, forwards or sidewise by simple and ingenious apparatus controlled by the engineer in the car suspended below the huge cylinder, where the engine, dynamos and other necessary machinery will be placed.

BASIS PATENTS.

Every inventor having any patent to sell is sure to assert that "his is the bottom patent," and that all others are "base infringements." To become the purchaser of a patent now-a-days, particularly any patent relating to electrical devices, is practically equivalent to buying a law-suit. Hence investors are not so easy to be found, as was once the case, and as a consequence of the distrust of patents in general thus engendered, very many enterprises based on patents languish or fail utterly to obtain pecuniary support—enterprises which in many cases would prove most profitable if the present distrust did not exist. The question naturally arises, "What is to blame for all this, the mendacious statements of inventors in general, or the laws relating to patents in particular?" We incline to the opinion that the former (*i. e.*, statements) are the natural outgrowth of the latter (the laws). Our English cousins, in their patent act of 1883, wisely inserted a compulsory license clause; and, so far, it has worked well.

With such a law on our statute books we would hear no more of basis patents. The English law provides that an improver may demand a license from the original patentee, which he is obliged to grant for a fair consideration, the amount being fixed by the Board of Trade in case of controversy. As a result, the public at large are benefited, and the original patentee receives adequate remuneration. Monopolies are impossible. Much needless legislation is avoided, and the investor is in a measure safe. Basis patents of course there must be, but such a crop of only and original inventors as this country invariably produces, where the patent is of any value, would hardly be possible. We would like to see such a law, and which also might well be made retro-active in its effect. As a rule, we don't advise tinkering with the patent laws, but a little reform in the direction indicated would undoubtedly be advisable. Should such a law come into effect, there would undoubtedly be great rattling of dry bones in various quarters, but the country at large would be greatly benefited.

ELECTRICAL NEWS OF THE WEST.

Our city public library, which has been closed for some months past, has at last got into good shape on the upper floor of the City Building. Besides the smaller rooms, private offices, wardrobe rooms, etc., there is a fine reading room, a sort of half story over the library room proper, a large and commodious reference department, and away from all annoyance, where cranks and other inventors will not be disturbed in their deep meditations by the giddy talk of novel readers and other frivolous people, there is found a patent report department, where will hereafter be found the hopeful patriarch who has almost reached a successful perpetual motion, and the elderly maiden who skims through each new report in search of a hint at something in the line of invention which may fall to her lot, either as original concoctor or as improver, that her latter days may be joyous and peaceful.

All these rooms by day are light, cheery and well ventilated, and when the shades of night come swooping down, electric lights, as chandeliers, pendants, portable, or bracket lamps give the whole a cheerful, plentiful illumination.

This is of course an addition to the original incandescent plant, in the building, and between these rooms and the dingy, uncomfortable quarters formerly occupied, no comparison can be urged. Our public library is now in first class shape.

Since the anarchist riot here in May, the public has been kept on the ragged edge of expectancy for developments in the line of bombs, grenades and what not, until nearly everything picked up which does not carry a label or some designating mark is assumed to be possessed of the power of cleaning out an entire neighborhood if incautiously handled.

A case occurred here a few days since

which, to the initiated, is ludicrous enough. A while ago a reporter for a daily paper told how some innocent parties came near being blown into kingdom come by careless handling a couple of dynamite bombs picked up on the street. The description stated that these were made of a couple of sections of pipe about six or eight inches in length, fastened together at one end parallel to each other, while at the opposite ends two safety fuses were firmly attached.

One of the finders walking carelessly along stubbed his toe and fell with the terrible engine of destruction in his hand, but fortunately his presence of mind did not forsake him, and he held the bomb high in the air to prevent contact with the pavement where he fell.

The infernal machine finally found its way to an electrician who had the temerity to examine it.

The two tubes or barrels are two pieces of electric light carbon, and the fuses are No. 18 paraffine braided wire. The whole had sometime been an innocent resistance used for experimental purposes, and as it was picked up only a block or so away from the Western Electric Company's shop, the dangerous missile was probably not very far away from its place of birth when picked up.

The finding of part of the mail of the Oregon reminds one that there has not so far been any first-class theory advanced to account for her destruction.

It has always seemed possible that her destruction, in so sudden and mysterious a manner, might be attributable to a wild roving percussion torpedo.

There has been an immense amount of experimenting done with these, and as they are made to take a certain place, to sink to a given depth in the ocean, which is, of course, a little below the water line of a ship, supposing one of these to have escaped from the experimenter, how is it to be recovered? Or, suppose one of these to have been aimed at a vessel or other object, and missed its mark, how is it to be prevented from doing mischief if run into by any floating object? And how long before it will lose its power for harm? Every now and again we hear of a bomb being exploded which has lain around loose out-of-doors since the war. These are not nearly as carefully protected against moisture as a percussion torpedo, which is formed expressly for water service.

No experimenter would be at all liable to tell of it if his torpedo did get away, knowing as he must the possible results which might follow.

Perhaps it was a coal barge in this case; but, given the fact that percussion torpedos are swimming around in the briny deep, let us hope that the whales and the sharks may do all the sub-aqueous experimenting with them in future.

The inside of the Chicago Opera House, which experience has shown to be to some extent faulty from an acoustic standpoint, is being altered for the better. Some changes in the electric lighting will also be made in the building.

The North Side Museum has also been relashed and has blossomed out into a theater and cafe, under the name of Casino.

The Casino has all modern improvements, electric lights, an excellent opera troupe, an injunction, etc. Cheap theatricals afford good amusement in Chicago, and keep one class quite busy, while the regulars are none too well patronized. It will be different in the fall. Then all will thrive as heretofore.

The poles in Evansville, Ind., belonging to the Cumberland Telephone Company, in accordance with an order of the Council, were cut on the 8th inst. The company had ceased to give night service after the decision of the Supreme Court sustaining the $3 law, and refused to renew it. A correspondent says that the company has violated nearly every provision of its original franchise, and that the action of the Council is very generally sustained by the public.

The American Bell Company filed four suits in the U. S. Circuit Court at Dallas, Texas, on the 28th of June, but the matter was kept quiet until the 3d of July in order to get service on the defendants. The suits are against the Texas Pan-Electric Telephone Co., *et al.*, the Abilene Telephone Co., *et al.*, and the Dallas Pan-Electric Telephone Company, *et al.* The suits pray that the Pan-Electric Co. and others be enjoined against infringing, and for an injunction *pendente lite*, and also a writ of subpœna for the Denison & Texas Pan Companies and J. Ourand, J. C. Fields, H. Tone, W. Bass, Lucillious Brooks, G.W. Feltz, W. T. Scott, J. P. Smith, Max Elser, W. A. Huffman, N. Wallerich, Drew Pruitt, Wallace Hendricks, Thomas C. Looney, Isham G. Harris, and Augustus H. Garland, commanding these parties to appear and answer the bills of complaint.

The injunction is made returnable to the January term of the court, which convenes at Dallas. J. S. Armstrong, president of the P. E. J. company, says the suit against his company is set for the August term.

It is understood that the subscribers will be untouched by these suits, and claimed that the defendants have been for some time anxious to have the matter brought before the courts and settled. It is evident this must be so, otherwise there would have been no need of the secrecy which the Bell Company practiced in holding the public aloof from knowledge of the suits some five days until service could be had on these parties so anxious for justice.

The Pan-Electric system permeates much of Texas, and that State is its stronghold. It has been in operation for some two years.

The local manager of the Pacific Mutual Telegraph Company has disappeared from Kansas City, leaving a shortage in his accounts which is assumed to be about $2,000. It is said he has covered the discrepancy by making drafts on fictitious parties East, signing these as manager, and depositing them in the bank. His wife and three children reside in Kansas City. He has so arranged his affairs that not until he had been gone from the 3d to the 7th was anything wrong suspected. He had been in the company's employ for the past two years.

Bloomington, Ill., has just had a whirl at the cyclone business. About 7.30 P. M. on the 9th instant the cyclone appeared, having been announced as imminent by the Signal Office at Washington. The bottle-green sky and the funnel-shaped cloud terrified the people, but fortunately lightning, hail, wind and the icy-cold atmosphere did but little damage. The cloud mop did not condescend to touch the ground, and the town escaped with only a bad scare.

At Charles City, Iowa, at three o'clock in the morning of the same day, a furious tornado made itself felt by rudely carving and skinning garden shrubbery, house-tops and other obstacles in its path.

A final decree was entered here on the 9th instant, by Judge Blodgett, in the patent case of the American Bell against Baird & Dillon, involving two Bell patents—one of March 7, 1876; the other of January 30, 1877. The judge held that both patents were valid, that defendants had infringed, and granted a perpetual injunction. Nominal damages of one dollar were assessed.

The last cyclone lie comes from Cedar Rapids, Iowa, where "a bolt of lightning swooped down upon a Bible in a pulpit, and tore out the entire book of Numbers, leaving the rest of the book unharmed." Charley Eaton says the man who wrote the above can't live in Cedar Rapids. When a Cedar Rapids man lies, he tells something that some one can believe—not such rot as this is.

Col. Lynch, broker, 146 La Salle, gives the following telephone stock values:

Chicago	$360 @	$375
Central Union	46 @	48
Michigan	64 @	65
Iowa Union	15 @	18
Great Southern	30 @	32
Great Southern, Script, 90 cents on the dollar.		
Colorado	18 @	20
Rocky Mountain Bell	40 @	45
Missouri and Kansas	55 @	57
Missouri and Kansas, Script, 55 cents on the dollar.		
United	15 @	17
Cumberland	65 @	70
Wisconsin	103 @	105
Bell of Missouri	147 @	150
East Tennessee	175 @	180

CHICAGO, July 12, 1886.

When the Wires will go Under Ground.

The Electrical Subway Commission is awaiting the reports called for at its last meeting, when it is intimated that the work of burying the wires will be begun at once. These reports are first, one from the mechanical expert elaborating the plan already adopted of a conduit of asphalt or bituminous concrete, and the mode of distribution best adapted to the wires of different electrical service; second, from the engineers, on the capacity of conduit required for different classes of wire in the different parts of the city and the order in which the several localities can be most conveniently served; and, third, from the course of the Commission generally as to a company to lay, operate, and maintain the subway under the direction and control of the Commission, and suggesting the necessary legal precautions and safeguards in the government of the company, with a general plan of contract to be made by the Commission with the company.

It is understood that these several reports are about ready for submission, when they will be immediately acted upon by the Commission and the actual work begun with the least possible delay. The counsel of the Commission has several proposals before him from responsible parties for the formation of conduit companies, so that no delay will be required to find the capital and organize the company.

An Infringement on a Telegraph Patent.

George W. La Rue has obtained a temporary injunction from Judge Addison Brown, in the United States Circuit Court, against the Western Electric Company. The suit was brought on an assignment of the patent granted to Edgar A. Edwards on January 16, 1883, for an improvement on the Morse telegraph key, consisting in substituting for the trunnions or pivots upon which the lever vibrates a torsional spring or strip of metal. The patent claims the invention of a "contraction in a telegraph key of the lever fulcrumed upon the torsional spring with the adjusting screws for regulating the amplitude of the lever movement and the retractile reaction of the torsion spring."

The defendants answered through George P. Barton, their attorney. The defence was that the torsion spring was used on the "sounders" at the end of the line where the message is received, and that a sounder is not a telegraph key such as is referred to in the application for the patent. Judge Brown decides that the use of the spring in the sounders is an infringement on the Edwards patent, and granted a temporary injunction in Mr. La Rue's favor.

A curious application of the magnet is described in a French journal, the subject of it being a clock recently patented in France. In appearance the clock consists of a tambourine, on the parchment head of which is painted a circle of flowers corresponding to the hour signs of ordinary dials. On examination, two bees, one large and the other small, are discovered crawling among the flowers. The small bee runs rapidly from one to the other, completing the circle in an hour; while the large one takes twelve hours to finish the circuit. The parchment membrane is unbroken, and the bees are simply laid upon it; but two magnets, connected with the clock-work inside the tambourine, move just under the membrane, and the insects, which are of iron, follow them.

Wrinkles—Electrical and Otherwise—Practical Information.

Brass castings shrink $\frac{1}{8}$ inch to the foot when cooling.

To bend copper pipes, fill them with rosin or lead, which will prevent them from buckling in the bends.

Copper castings shrink $\frac{1}{4}$ inch to the foot when cooling in the moulds, and also shrink (as do all other castings) most where there is the greatest substance of metals.

Shrinking of castings sideways and endwise, on casting of 3 inches and less size is compensated for by the shake in the sand given by the moulder to the pattern in order to extract it from the mould.

A green transparent varnish for metals may be made by grinding a small quantity of finely powdered chromate of potash, and adding a sufficient quantity of copal varnish thinned with turpentine.

To blaze iron pipes, first clean the split edges, covering with borax that has first been ground on a stone with water, and bind a piece of brass wire along the seam, with small iron wire wound around the pipe. Place the pipe in a charcoal fire, commencing at one end of the split, drawing the pipe through the fire as the brass melts.

Mix a handful of quicklime in four ounces of linsced oil, boil to a good thickness, then spread it on tin plates in the shade, and it will become very hard, but may be easily dissolved over the fire as glue. A glue which will resist the action of water is made by boiling one pound of common glue in two quarts of skimmed milk.

For making a rust joint that will bear heat, cold and rough usage, the following formula has been highly recommended: Ten parts iron filings, three parts chloride of lime and enough water to make into paste. Put the mixture in between the pieces to be jointed and bolt them together, leaving until dry. After twelve hours the cement has been known to break off the solid iron.

In order to obviate the inconvenience and loss of time involved in the ordinary mode of fixing upon a lathe-chuck certain special kinds of work, such as thin steel disks or small circular-saws, the chuck may be converted into a temporary magnet, so that the articles, when simply placed on the face of the chuck, are held there by the attraction of the magnet, and when finished, can be readily detached by merely breaking the electric current and demagnetizing the chuck. The face-plate of the magnetic chuck is composed of a central core of soft iron, surrounded by an iron tube, the two being kept apart by an intermediate brass ring; and the tube and core are each surrounded by a coil of insulated copper wire, the ends of which are connected by two brass contact-rings that encircle the case containing the entire electro-magnet thus formed. These rings are grooved and receive the ends of a pair of metal springs connected with the terminal wires of a battery, whereby the chuck is converted into an electro-magnet capable of holding firmly in its face the article to be turned or ground. For holding articles of larger diameter, it is found more convenient to use an ordinary face plate, simply divided into halves by a thin brass strip across the center; a horseshoe magnet, consisting of a bent bar of soft iron, with a coil of copper wire around each leg, is fixed behind the face plate, each half of which is thus converted into one of the poles of the magnet. The whole is inclosed in a cylindrical brass casing and two brass contact rings, fixed around this casing, are insulated by a ring of ebonite and are connected with the two terminal wires of the magnet-coils. A similar arrangement is also adapted for holding work upon the bed of a planing or drilling machine, in which case the brass contact-rings may be dispensed with, and any desired number of pairs of the electro-magnetic face-plates are combined so as to form an extended surface, large enough to carry large pieces of work. For exciting the electro-magnet, any ordinary battery that will produce a continuous current of electricity can be used.

Telephonic News

*** Bell Telephone stock is on the rise, and is now hovering around $200.

*** Another telephone line between Topeka and Kansas City is being constructed. This time hard-drawn copper wire is being used.

*** "Well, that's a new idea. I never heard o' putting spittoons on the side o' the house before," remarked an old countryman, as he walked up to the telephone transmitter and made a bull's-eye the first shot.

*** The Warrenton, Plains and Alexandria Telephone Company have finished their line from Plains, via Broad Run, Little Georgetown and Bethel Academy, to Warrenton, and have it in working order. The telephones were gotten from Mr. Henkle at Baltimore. The line will be continued to Alexandria, Va., at once.

*** The telephone company, of Cincinnati, has just gotten out a printed list of the additional subscribers, being complete up to to-day. It shows that 247 people have had telephones put in their offices and residences since the last supplement to the index was published. This shows that the business of the company keeps pace with the times.

*** J. B. Hunt, superintendent of the New England Telephone and Telegraph Company, formerly located in Greenfield, but whose headquarters are now in Worcester, Mass., was last week presented with a large and costly album containing the photographs of the managers, operators and other employes of the old Northern division. Mr. Hunt is a very popular and capable official.

*** For some time past the telephone company, of St. Louis, has been bothered with private wires strung along their poles on South Sixth street. One night recently John Booth, formerly night watchman on Twelfth and Pine streets, was caught in the act of stretching a wire from a bell in a saloon at 300 South Sixth street to No. 311 on the same street, and was taken to the station for trespassing and defacing property.

*** Another telephone line will be put up between Lincoln and Omaha, Neb., and will be opened for the "carrying of words" sometime in September. It will be a "through line," so to say, the only stopping place to be at Ashland. The wire will be hard-drawn copper, and it is expected and intended that the line will and shall very much lessen the time necessary in sending telephone messages between the places named.

*** At the annual meeting of the stockholders of the Bishop Gutta Percha Company, held on the 7th inst., E. I. Anderson, of Chicago, and H. E. Blitz and Samuel Boardman were elected trustees. At the meeting of trustees held on the same day, Samuel Boardman was elected president and treasurer, H. E. Blitz was elected vice-president, and Henry A. Reed was appointed secretary and general manager.

*** The Bell Telephone Company discounted the Telegraph Company in reporting the results of the championship lacrosse match in Toronto. The telephone company, in bringing the news from Toronto to Montreal, "repeated" at Kingston and Prescott, the distance to Montreal being too great for present telephonic management. Still the telephone reports got into the Montreal *Star* office close on half an hour ahead of the telegraph reports, and the fact reflects much credit on the Bell Company's way of working things.

*** Dr. Austin Flint, of New York city, expresses a belief that within fifty years the principle of the telephone will be applied to ultra-thoracic respiratory and heart sounds, so that they may not only be transmitted with distinctness to the ear of the physician, no matter how distant the one may be from the other, but that "the sounds from the chest of a patient may be phonographically registered, transported never so far, and made available after an indefinite period." This scheme will open up a new field for the specialist, who will order a few breathing spells sent to him by express.

*** In New Orleans a discussion has arisen among the members of the Police Committee of the City Council concerning a contract made with the Police Telephone and Signal Company, of Chicago, in which the city was to furnish 1,200 poles for the wires of the Signal Company. Some of the members claimed that the city had the right to use the telephone poles for this purpose, and thus save $6,000 or $8,000 of expense, and the officers of the telephone company, after considering the matter, state their willingness to permit the city to use the poles for this purpose, only asking that the company be relieved of the obligations now imposed by the city, if it is to furnish the free use of its property for this purpose and at so great a saving to the city—a reasonable proposition.

*** A streak of telephone economy has become epidemic in several of the departments in Washington. The rates there are $100 per annum. The Secretary of the Navy found, upon investigation, that there were nineteen instruments used in the various branches of the Navy Department, and has given orders that by the 15th of July the number shall be reduced to eight. This will leave one on each floor of the department, one at the navy yard, one at the naval observatory and one at the marine barracks. About the same number in use by the War Department, and about a dozen will be removed. The State Department has only three instruments in use, and one of these connects only with the White House and Treasury Department. These will probably be allowed to remain. Fifteen instruments will be removed from the Treasury Department, leaving one for each floor.

*** The Texas territory of the Pan Electric people, which they have worked to good advantage in the past, is now to be contested, the American Bell Telephone Company having brought four suits against them in the U. S. Circuit Court at Dallas. A special agent of the Bell Company has been at work for several months gathering evidence and preparing affidavits to be used in these cases, which will be pushed to a hearing at the earliest possible moment. The suits are against the Texas Pan Electric, the Denison Pan-Electric, the Abiline, and the Dallas Pan-Electric Telephone Companies. The suits pray that the Pan-Electric Telephone Companies and others be enjoined from infringing upon the rights of the Bell Company. The Pan-Electric system, embracing all these companies, has been a strong rival in Texas of the Bell Company, having exchanges in all the leading cities of the State.

*** Carrier pigeons are being put to a novel use in Brussels. A baker in that city who does an immense business, having a central depot and fifteen branch establishments throughout the town, applied recently to the telephone company for an estimate of the yearly cost of communication among his different shops. The charged asked by the company seemed to him so high that he resolved upon starting a new means of communication for himself. He had a pigeon-house erected at his headquarters, and purchased fifty carrier pigeons of the choicest breed. Every morning each branch has three pigeons, which are sent off to the head establishment with the list of orders wanted by the hotels and families in connection with the branch. Each pigeon, upon its arrival at its own domestic floor, touches a spring which has an electric communication with a bell in the manager's office. The system has succeeded so admirably that it will probably be adopted by other great houses. The inventor writes that the cost of his fifty pigeons was less than the telephone company asked for two months' subscription.

*** The Peoria Co-operative Telephone Company, at Peoria, Ill., has been organized with a capital stock of $50,000; incorporators, Benjamin Warren, Jr., Paul O. Bauer, Henry J. Marmien, and George A. Ditewig.

Telephones in the Government Departments.

Our esteemed contemporary the *Globe-Democrat* is authority for the assertion that at a recent Cabinet meeting the members reported, at Mr. Cleveland's request, the number of telephones used in the departments. It was found that the total number, not including the Bureau of Printing and Engraving, was 150, and the cost of the telephone service in the departments about $15,000 a year. Mr. Cleveland thinks that some of these telephones can be dispensed with.

The Hon. Augustus H. Garland reported that the number of telephones in the Department of Justice is ten. He failed to include the Pan-Electric telephone, the cost of which to the Government will be $300,000. The cost to the Administration and the Democratic party cannot be estimated as yet, but it may be greater than Mr. Cleveland imagines.

If Mr. Cleveland wants to make a saving in the public service, the first thing for him to do is to take the Pan-Electric telephone out of the Department of Justice.—*N. Y. Sun.*

Jack Frost Killed By Electricity.

In some parts of the State of California, when the season is more than usually forward, a severe frost does bad work in the first week in April in some of the lowland vineyards.

To prevent damage from this source, various expedients have been resorted to, the latest of which is the application of electricity to conquer Jack Frost. The San Francisco *Merchant* has the following interesting account of the new process:

"We have previously referred to the frost alarm introduced here by Mr. J. H. Drummond, of Glen Ellen. A wire connected with a thermometer in the lowest part of his vineyard, most subjects to frosts, gave an alarm in his house when the thermometer fell to a certain degree. Mr. Thomas S. Glaister, of Sonoma, has conceived an idea which bids fair to out-frost the original freezer. It is simply the same idea and principle on a more extended scale. Mr. Glaister's idea is that if the wire can signal the approach of frost to a man's house, and so start the alarm, it can be made to do more and better work. In the frost season every vineyardist has the fires ready set, anticipating the approach of the common enemy. Mr. Glaister's plan is to have an electric wire connecting from the main battery at the thermometer with each separate bonfire, so that when the temperature goes down to 33° the electric spark will be carried to every heap and so start the fires all around the vineyard, while the owner, without rousing up all hands, getting the coffee ready, and any delay in starting the individual fires, can stand complacently at his window inside the house, watch the fires starting and retire to roost again, with the satisfaction of knowing that his vineyard will be well protected before the enemy's arrival.

"The experiment has been tried on a small scale at Sonoma on three or four piles of firing placed fifteen feet apart. There it was entirely successful. The points at the wires are held in position by a piece of cord fastened on each side of the heap to be burned The fire of course burns the cord and the wire springs out to one side, thus saving the points for future use. The point of the wire connects with a small piece of gun-cotton enclosed in paper that is saturated with kerosene, or some other inflammable material which will ensure the fire igniting. This should be covered by an old tin, of which there are always plenty to be found on any vineyard, to protect the points where the electric spark connects with the gun-cotton from becoming damp and useless through the effects of fog and dew. The estimated cost of the whole appliance, including wire, battery, thermometer and arranging the same, is from $100 to $150 for a vineyard of 200 acres. A larger battery would answer the purpose for several adjoining vineyards, thus reducing the individual expense. This figure means, of course, an economical method of working the wire without needless outlay for new or fancy posts."

Effects of Magnetizing Iron Bars.

It has long been known that when an iron rod is magnetized its length in general is slightly increased. Some experiments on this effect of magnetization, an account of which has been given in two papers recently communicated to the Royal Society, show that if the magnetization is carried beyond the point at which the magnetic elongation of the rod reaches a maximum the length of the rod, instead of remaining unchanged, steadily diminishes, the curve expressing the relation between the length and the magnetizing force descending in a perfectly straight line, which within the limit of the experiments shows no tendency to become horizontal. Some further experiments, not yet published, have also been made with rings of iron, instead of rods, and effects of precisely the same character were obtained The diameter of a ring was found to be increased by a comparatively small magnetizing current, and diminished by a strong one. The retraction in question does not begin to occur until after the stage of magnetization, loosely called the "saturation point," has been passed, when, according to the common belief, the magnetization of the iron has practically reached a limit, and is not sensibly affected by any further increase of the magnetic force, and hence arises a difficulty in accounting for the phenomenon. The most obvious method of explaining the retraction is to assume that under the influence of increasing currents the magnetic attraction of the particles of the iron toward one another is increased, and thus the rod becomes compressed. But this cannot be the case if the magnetic condition of the iron has become constant and independent of the magnetizing current. And a similar objection will apply to any hypothesis which assumes, as perhaps all must, that some property of the iron dependent upon its magnetic condition varies in a sensible degree with the magnetizing force after the saturation point has been passed.—*Iron Age.*

The Solidification of Oxygen.

Professor Dewar has succeeded in the production of solid oxygen. At the Royal Institution he lately exhibited for the first time to a few friends the method he employs. Last year the professor gave a lecture on liquid air, but, although he and other experimenters had made liquid oxygen in small quantities, no one had succeeded in getting oxygen into a solid condition. The successful device employed at the Royal Institution depends upon allowing liquid oxygen to expand into a partial vacuum, when the enormous absorption of heat which accompanies the expansion results in the production of the solid substance. Oxygen in this condition resembles snow in appearance, and has a temperature of 200° C. below the freezing point of water. A supply of this material will enable chemists to approach the absolute zero of temperature, and to investigate many interesting changes in the physical properties of bodies under the primordial condition of the temperature of space.

*** At the meeting of the City Council of Evansville, Ind., last Tuesday, an order was issued to the Cumberland Telephone Company commanding them to file notice with the City Clerk that they would comply with the contract to supply both night and day service, and to raise their wires to contract height. Failing to comply with the order, it was ordered that the wires and poles be taken down by the city at the expense of the telephone company. The company did not notice this action, and large forces of men, under the directions of the chief of police and chief of the fire department, proceeded to remove the poles and wires. Damage suits are threatened against the city.

*** Mr. M'Gowen, Deputy Postmaster-General of Victoria, has been instructed to travel and make full inquiries and obtain all available information with regard to the latest improvements in telegraph and telephone instruments, electric batteries, etc., and other appliances as used in the leading cities of Europe and America.

Conductivity of Rosins.

It has been ascertained that the ordinarily perfect insulators of the rosin type become more or less good electrical conductors when heated to softness or melting; afterward their conductivity increases with the temperature. A mixture of guaiacum with naphthaline, the latter a perfect insulator and of the same melting point as guaiacum, conducts much better than the rosin alone, being much less viscous. Oxidized or acid constituents in the rosin also increase their conductivity. Some always conduct very little, as Canada balsam, copal, mastic and dammar; Chios turpentine, pitch, asphalt, colophonium, are moderately good conductors when soft or melted. Styrax, jalap, scammonin, dragon's blood, amber; the balsams of Peru, Tolu and copaiba; shellac, laudanum, aloes, myrrh, Venetian turpentine, are good conductors when melted.

Iron Cheaper than Wood in Germany.

The revolution which time has brought about in wood and iron in Europe is strongly illustrated in the fact as recorded by Consul Tanner, Chemnitz, that the scarcity of the former and the vast development in the latter have tended to the discontinuance, to a great degree, of the use of wooden cross ties on railways in Germany and the use of iron instead. The same holds true in regard to telegraph poles, in which iron is replacing wood.

The change, adds the Consul, "is not due to any superior merits in iron, for the purposes specified, but is wholly a matter of economy. Wooden cross ties have many points of superiority over iron. They are more easily handled, placed and replaced, and do not bury themselves so readily in the roadbed as iron ties do, and would unquestionably remain in general use if they could be placed in Europe at reasonable prices, and if means could be devised for their preservation for a longer period than they last in Germany (four months)."

Four New and Funny Stories About the District Messenger Boys.

"Our boys are very frequently called upon for ludicrous services," said Superintendent Leisser, of the American District Telegraph Company, "but the strangest call that has ever been made to my knowledge was that of a merchant who lives on North Twelfth street. He is a stout, red-faced, good-natured looking man, with a funny eye. He called on me and said he wanted seven boys of different sizes for two or three days—that they must be prepared to live in his house day and night so long as he would require them. What do you think he wanted them for? His wife had died shortly before, and his sister in-law had written to him that she was coming to visit him. He was afraid she had a sinister motive in making the pilgrimage and intended to establish herself as housekeeper. To discourage such a proceeding he conceived the project of passing off the boys as his own family and having them make life miserable for her during her stay. Accordingly he made each throw aside his uniform and put on old clothes. A disgraceful set of brats they were when they received the visitor with dirty faces and hands and clothed in rags. They played foot-ball with her bonnet, broke open her trunks and masqueraded in her silks, spoiled her cooking by sprinkling the joint with snuff, and played one hundred monkey tricks prompted by the merchant. They all got in a room over her's and maintained such a racket during the night that she could not sleep. When she went out to the street, the little imps formed in a ring around her and executed an impromptu war dance. Poor woman, how she must have suffered. She bore her cross patiently for two days, but there was an end to her endurance, and on the third evening it collapsed. She soundly cowhided one of the boys and took her departure in a rage, first giving her relative a piece of her mind regarding the young cannibals he was raising. It was no wonder, she said, that her martyred sister was in her grave, and she did not propose to be similarly tortured to death. The best of the joke was the children were palmed off on her as those of the merchant's first wife, while he had only been married once."

One of the boys is an intelligent-looking lad, with eyes as deep a blue as his uniform. His fair hair and full features left no doubt as to his German parentage. He said to the reporter:

"We meet cranks, but some people treat us well. There's one young Irishman comes for me every Thursday to accompany him when he goes to see a German girl he's stuck on who speaks no English. I interpret between and don't laugh a bit when he says silly things about how much he loves her and how beautiful she is. He doesn't let me kiss her in German for him, though. She's a daisy, but he deserves her, for he's one of the best fellows in the world and gives me a dollar every time. I think they will soon be married. He is picking up German very fast, and she can talk some English with an Irish brogue."

Another boy, who sat waiting his turn, burst out impatiently before his companion had finished:

"I had a picnic once. A big fellow came one day last summer and asked for an intelligent boy to go to the park with him. I was sent. We rode out in the cars and on the way he told me that I was not to loose sight of him all day, but walk right behind him everywhere he went, and take him home at about ten o'clock to an address which he gave me. Of course, he got drunk. He went to Belmont and had dinner. He got pretty full in the evening and went all round the park. At last he fell asleep on th e grass and I lay down beside him. At ten o'clock I wakened him and led him out to the cars. He wasn't hard to deal with; but, as he was stupid with the drink and sleep, it was nearly midnight when I left him at home. Next day he came around and paid for the time he had me, and gave me three dollars to myself."

A lawyer's office-boy, who was formerly a district messenger, told the reporter that his case beat the deck. He said:

"It was a curious way of calling for a boy, too, for a telegram came saying that a messenger was wanted at a certain address on Chestnut near Ninth. When I got there a tall, thin old man told me that the people around him were trying to poison him, and that he wanted me to taste his food before he ate it—like trying it on a dog, you know. I didn't wait to hear any more, but ran home and reported at the office again."

.... The curious question has been asked why oaks and elms are especially liable to be struck by lightning. It was declared in 1787 that the elm, chestnut, oak, and pine, were the trees most often struck in America, and in 1860 G. J. Symonds stated that the elm, oak, ash and poplar were the most frequently struck in England. A Madgeburg record, covering ten years, reports injuries to 265 trees, 165 being oaks, 31 Scotch firs, 32 pines, and 20 beeches. It has been suggested that the frequency with which oaks are struck is due to the presence of iron in the wood.

.... A dispatch from Kansas City, Mo., says that L. B. Roberts, local manager of the Pacific Mutual Telegraph Company, has disappeared from that city, and an examination of the company's books shows that he is a defaulter to the amount of $2,000 at least. He left the city July 3, but evidences of his crookedness were not discovered until several days had elapsed. He is about 40 years old, and had been with the Pacific Mutual Company two years. In the past two weeks several drafts signed by himself as manager, and payable by fictitious parties at distant points East, had been deposited in Armour's bank. Thus he covered over the deficiency for the present, knowing that some time would elapse before the drafts would be returned protested. He leaves a wife and three children. Roberts had been guaranteed by the Fidelity Company of New York, and that corporation will probably have to stand the loss. Roberts came to Kansas City from St. Louis, where he had been manager of the Bankers and Merchants'. There is no clue to his whereabouts.

.... The B. & O. telegraph lines have entered Findlay, Ohio, and were warmly welcomed by the citizens. The increasing importance of Findlay, caused by the discovery of natural gas and petroleum, has made additional telegraphic facilities necessary.

.... A gentleman entered a telegraph office. "I beg pardon, but as I was coming along this afternoon I saw myriads of flies settled on your wires. Can you suggest any explanation of the phenomenon?" "About what time was it, sir?" "About 4 o'clock." "Ah! that accounts for it; that's the time I send the quotations of sugar and honey."

.... On July 2d the Standard Underground Cable Company completed the work of laying in Second avenue, from Nineteenth to Ninety-third street, three of its Waring anti-induction, lead-covered cables, of five wires each—a little more than 50 miles of wire. These are for the use of the Commercial Cable Company. The cables are laid in a plain spruce box, 3×5 inches inside measure, and the box then filled in with melted coal-tar pitch. The box is laid in a trench two feet deep. It is noteworthy that during the five weeks' work of laying these cables no interruption or hindrance to public travel was caused. During the time that this work was in progress twenty five thousand feet of a similar cable was laid by the same company for the fire alarm circuits entering the new Fire Department building in Sixty-seventh street. The Standard Company reports many new contracts in New York, Chicago, Pittsburgh and elsewhere, and is well satisfied with the outlook.

.... A Brooklyn *Eagle* man, one of the party of journalists investigating Pittsburgh natural gas, tells this story: We are invited to inspect the Pittsburgh Fire Department. The discomfited man from Boston saw a chance of getting partly square.

"Are your engine-houses supplied with the electric bed and seat?" he asked of a sedate managing editor.

"I don't know," was the reply, "what are they like?"

"Why," said Boston, "if you haven't got the electric seat, you are lamentably behind the times, even if you have got natural gas. The electric bed and seat is a delicate arrangement of springs which are put in action the moment the alarm gong rings. It gradually raises the engine-driver into a semi-erect position, throws him gently on a large rubber ball so exquisitely elastic that it causes the sleeper to rebound on to the seat of the fire-engine. So neatly is this performed that on many occasions the driver has been seen driving his engine out of the building while fast asleep."

"Possible?" said Pittsburgh; "Boston is a wonderful place. It will never need natural gas while you live there."

.... Some miscreant, armed with a strong and sharp pair of shears, climbed a telegraph pole on lower Broadway early on Wednesday morning last week and cut a cable strung there belonging to the Commercial Company. President Anderson, of that company, offered $1,000 reward for information that would lead to the arrest of the guilty man. The Commercial Telegram Company believe that the mischief was planned by wicked rivals in business. The cable that was cut was composed of wires serving 17 circuits, having 175 "tickers" dependent on them. On this same pole and within easy reach of the wire-cutter were the other cables of the company, and a little extra exertion would have enabled him to sever connection with all the tickers of the company, not only in this city, but in Chicago, Philadelphia, and Boston, over 1,500 in number. The damage done was quickly repaired. It is claimed that an architect in a building near where the wires were cut saw the man climb the pole and cut the cable and this man, it is said, has assured the company that if the miscreant be arrested he can identify him. His attention was attracted to the man by his actions when he cut the first wire, as he received such a shock that he made a good deal of a circus. The others were cut with more care.

TELEGRAPHIC

.... The city of Burlington, N. J., has adopted the Gamewell Fire Alarm Telegraph through special agent C. A. Rolfe.

.... The recently-elected officers of the Standard Underground Cable Company are: Geo. Westinghouse, Jr., president; R. S. Waring, vice-president; J. H. Dalzell, treasurer; C. H. Jackson, secretary.

.... It is reported from Berlin that the new telegraph rules regulating the tariffs on telegrams within the empire are causing general dissatisfaction, because of their arbitrary nature and the increased cost of service.

.... Representative telegraphers in Washington pronounce as a canard the story published in several of the larger cities to the effect that a strike is contemplated by the Western Union force here during the summer. One of the operators said: "We have had enough of strikes in this section. We have grievances, but will not attempt to have them righted by striking."

.... The annual meeting of the Electric Protection Company, Philadelphia, was held at the office of the company, 107 South Third street, one day this week, when the following officers and directors were elected: President, Charles M. Swain; secretary, Wm. Carley; treasurer, George B. Dresher; directors, Charles M. Swain, Charles D. Freeman, James Elverson, R. Lloyd and William P. Wheatland.

.... Since the Government took possession of the telegraph in Great Britain, a record has been kept of the number of telegraph messages sent yearly. In 1870 there were 9,000,000 messages; in 1875, 19,000,000; in 1880, 20,000,000; and in 1885, 34,000,000. This does not include press messages, which have increased nearly a thousandfold, due to the greater cheapness of the Government service over that of the companies.

.... The business of the Baltimore & Ohio Telegraph Company, at Buffalo, N. Y., has of late been increasing so rapidly that additional accommodations have been made necessary. Another floor has been set apart as a battery room, and it is already well filled. A handsome office on the second floor has been fitted up for Manager Larish and Cashier Smith, thus giving additional room in the operating department, which has been utilized for operating tables.

.... The phonoplex has been successfully introduced on the telegraph lines of the A., T. & S. F. Railway. One line that is being worked extends from Topeka, Kansas, to Newton, a distance of 135 miles, the longest phonoplex circuit now in operation. Mr. Paul Bossart, who superintends the introduction of this invention, finds the line conditions in the West much more favorable for it than in the East, and expects to be able to work it a much greater distance.

.... The operators employed by the Associated Press in New York have asked for increased wages, fewer hours' work, and an opportunity to enjoy summer vacations. The operators feel certain that their demand will be acceded to, as they believe the Associated Press managers are in no position to stand out in the matter. The men ask for $25 per week and extra pay for Sunday and overwork. They claim that the exacting nature of their work is such that it can be done only by a comparatively few persons in the business. This new movement on the part of the employes is regarded as a serious affair by the Associated Press, and is indirectly felt by the Western Union company. If the demand of the Associated Press men is acceded to, all the operators in the employ of the Western Union may make an effort to place themselves upon a similar footing. The Associated Press managers claim they are not alarmed by the situation. They say they do not anticipate that their men will stop workr or that there will be any interruption in thei business.

ELECTRICAL AND SCIENTIFIC

* * Carrolltown, Mo., is now lighted by 40-arc lights of the Sperry system, of which fourteen are double carbon lamps for street use and twenty-six single lamps in business houses. The company will have to add another dynamo soon.

* * A suit brought to enforce a contract to transfer an inventor's right is not one in which the United States courts have particular jurisdiction, and where the parties to the suit are citizens of the same State the State courts have power in a proper case to decree a specific enforcement of the contract. So held by the Supreme Court of Michigan in the case of Nichols *et al. vs.* March *et al.*

* * Two sun dials are on the Gray and Black Nunnery in Ottawa. The old clock on the eastern end of Fanuell in Boston was formerly a dial of this kind, and on some of the old church towers in England one may see them to-day. Aside from the kinds mentioned, the dials now in existence are intended more for ornament than for use. In the days when dials were used each one contained a motto of some kind, like these: "Times flies like the shadow," or, "I tell no hours but those that are happy."

* * A German writer remarks that the compound known as "zeiodelite." discovered by Simon, has not been used so much as its peculiar advantages would seem to suggest. It is prepared by mixing twenty-five to thirty parts of powdered glass with twenty parts of melted sulphur. This may be shaped into any design, and it cools into a stony hardness, resisting boiling water and the strongest acids. It can be united at a heat of about 400°.

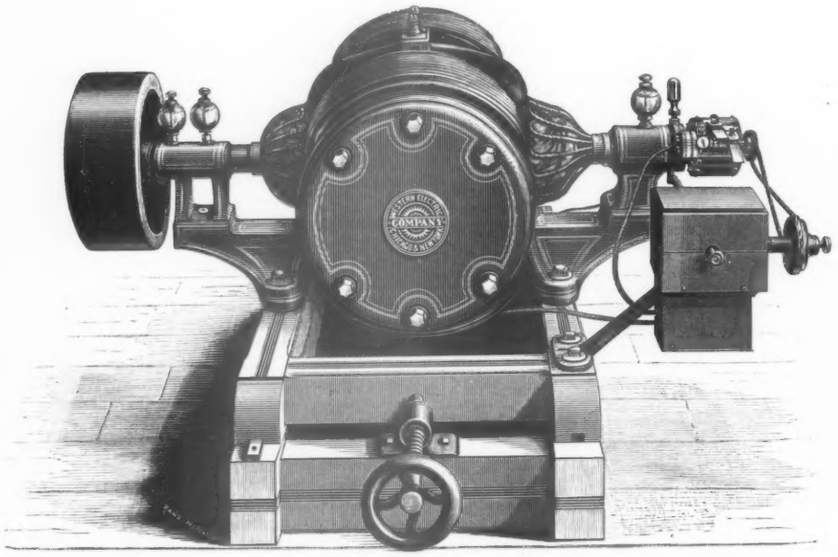
* * A fire hydrant in Halifax, Nova Scotia, was struck by lightning, and the report states that the street was torn up for the length of two blocks, and large rocks thrown to the surface. If this fire-plug was connected with the water mains running through the town, having numerous cross ramifications extending in all directions, the matter becomes all the more interesting in its relation to the advise given by lightning rod experts, who tell the public to carry these rods down to connect the water-mains.

* * There have recently been devised in Europe some new thermometers, with platinum or porcelain bulbs, by which very high temperatures, even those of a white heat, can be measured without having to resort to an expensive and troublesome pyrometer. The reading is taken in precisely the same way as at present with an ordinary thermometer, but the result is obtained by the pressure of air inclosed in the bulb, which is exposed to the heat. The pressure acts directly on a vertical column of mercury. The bulb is hermetically sealed and the instrument is unaffected by changes in the height of the barometer.

* * It is seldom that the Louisville *Courier Journal* hits the truth more squarely than when it tells the public that the writing part of editing a paper is but a small portion of the work. The care, the time employed in selecting, is far more important, and the fact of a good editor is better shown by his selections than anything else; and that, he knows, is half the battle. An editor ought to be estimated, his labors understood and appreciated, by the general conduct of his paper—its tone, its uniform, consistent course, aim, manliness, dignity, and its propriety.

Dynamo and Regulator of Western Electric Company.

A side view of the dynamo of the Western Electric Company, with their new regulator attached, is shown on this page. The method of attaching the regulator seems to be a particularly good one. The dynamo, which has been described in these columns before, is winning considerable favor in those localities where the system has been introduced.



Side View of Western Electric Company's Dynamo, with Regulator Attached.

* * In making the moulds for casting single pieces wet sand is sometimes preferable to dry sand because cheaper. The use of wet sand is but little known, and is seldom used, as it requires quite a degree of skill. The process is as follows: Pure moulding sand is heated, and mixed with one-third of powdered charcoal, and then common salt and powdered sal-ammoniac are added. The common salt imparts adhesive strength to the sand, and the sal-ammoniac prevents sputtering. After these ingredients are thoroughly mixed, the sand is allowed to lie until pliable. If the sand, on being used, does not show sufficient adhesiveness, more salt must be added, and should sputtering occur, more sal-ammoniac. Through the u of the two ingredients, and the repeated trials to determine the proportions in which they must be added to the sand, a moulding sand is obtained peculiarly adapted to the destined use.

* * Dr. Gore, F.R.S., the well-known authority on electro-deposition, has discovered that an aqueous solution of asparagine is a good medium for electrolytic baths. The solution he used was not quite saturated, and consisted of about 0.88 gram. of crystals of asparagine dissolved in 18 c. cm of distilled water. It was feebly acid to the test-paper, and was employed at a temperature of about 70° C. Some of the liquid was more or less saturated with different metallic oxides, and the resulting baths electrolyzed by currents from one to six cells of zinc and platinum in dilute sulphuric acid. Good deposits of cadmium were thus obtained, 0.23 gram. of hydrate oxide of cadmium dissolved in 20 c. cm. of the solution, using an anode of cadmium and a cathode of copper. Zinc was deposited from 28 gram. of zinc oxide in 23 c. cm. of solution. Magnesium in a film was also deposited from calcined magnesia with magnesium and copper electrodes; copper was obtained from cupric oxide with copper and platinum electrodes; mercury from red mercurous oxide with platinum electrodes, and silver from oxide of silver with a silver anode and platinum cathode. In the latter case the deposit was good, the bath consisting of 0.33 gram. of silver oxide in 20 c. cm. of asparagine solution.

The Electric Light on the Suez Canal.

The passage of the Suez Canal, which until recently occupied from thirty-six to forty-eight hours, can be made, now that navigation during the night is possible, in sixteen hours for mail steamers and war vessels, fitted with the electric light apparatus and projectors, prescribed by the Canal Company. This important advance is the result of a very interesting report by Commander Hector, of the steamer Carthage, belonging to the Peninsular and Oriental Company, and addressed to the directors, mention of which appears in London *Engineering*. This report was written after the Carthage made the first continuous passage, under the authorization of the Canal Company, given the 1st December, 1885. The Carthage arrived at Suez after a run from Port Said of eighteen hours. The actual running time was sixteen hours, there having been two delays caused by impediments in the channel; the mean speed made was 5.43 miles per hour. The passage as far as Ismailia was the most interesting, because it was the first attempt to take a large vessel through at night, with the aid of the electric light. On the arrival of the Carthage at Port Said, it prepared for its immediate entry into the canal, and its free passage to Ismailia. The start was arranged for 8 P. M., and a number of persons interested in the experiment went on board. The projector was placed forward and at a height of 16 feet above the water. Shortly before eight the dynamo was started, and the circuit closed. As soon as the projector was illuminated, it was evident that its position had been well selected, and that the power of the beam, as well as the amplitude of the luminous zone, were ample to insure the success of the experiment. The number of surrounding lights, and the presence of a steamer taking in coal by the light of torches, prevented those on board the Carthage from seeing the buoys placed at the entry of the canal. At eight o'clock the mooring ropes were cost off, and as soon as the steamer had passed the buoys the entry of the canal could be seen. The entrance to the canal is on a curve which may cause a difficulty if the buoys are lost sight of. To prevent this, the first two had been previously lighted. It was evident, however, that this precaution was unnecessary, because the power of the projected beam was ample to enable the outlook to see the buoys. The moon did not rise till nine o'clock, so that during the first hour the run was made in darkness. As soon as the straight portion of the canal was reached, the value of the projector was evident, the amplitude of the beam being sufficient to illuminate the buoys on each side of the channel. Further on the banks of the canal, as well as the channel markings, were clearly visible; the effective range was then three-tenths of a mile, more than sufficient for the handling of the ship. The light color of the banks, reflecting the beam from the ship, further assisted the illumination, and the influence of this reflection was especially noticeable along the high banks of the curves near Ismailia. This station was reached at 5.15 A. M., without any difficulty having been experienced during the journey, but with a delay two miles south of Ismailia. A dredger on the western side had neglected to show her lights, and the pilot was obliged to stop, and on again starting, although the dredger had been passed successfully, the ship had not recovered sufficient speed to take the curve of the canal. It was therefore necessary to stop again, and go astern. In this way an hour was lost; but the average speed made, allowing for this delay, was 5.09 miles per hour from Port Said. The practicability of passing through the canal by the aid of the electric light was thus demonstrated by this first experiment. The directing lights placed on the banks opposite each station served to direct the ship during the moments of extinction of the projector. It should be added that the conditions were very favorable for the success of the experiment: a clear air, brilliant moonlight after 9 P. M., and no wind. However, the captain in his report does not consider that the moonlight assisted in the success of the experiment, as during the first hour, when the night was quite dark, no difficulty was encountered, and the buoys marking the channel could be very clearly distinguished. It is quite unnecessary to enlarge on the advantages arising from the economy of from eighteen to twenty-six hours without any serious increase in expense but it will be of some interest to point out how the result was brought-about. After considerable investigation, the Suez Canal Company established six fixed signal lights supplied with petroleum, between Port Said and kilometre 54; these lights give the pilots their alignment in the straight sections. The company also prescribed, in certain regulations for the night transit, the conditions which the electric light apparatus must fulfil. Article 2 runs thus: The commanders of vessels of war and mail steamers that are intended to be taken during the night from Port Said to kilometre 54, and *vice versa*, must notify to the agents of the company at Port Said, Ismailia, or Port Tewfik, that they are provided with the following apparatus. 1. Forward: An electric projector with a range of 1,200 metres. 2. Aft: An electric light capable of illuminating a circular field of from 200 to 300 metres in diameter. 3. On each side an electric lamp and reflector."

These conditions were laid down after a series of experiments made in the canal by the company, aided by M. Lemonnier, of the well-know firm of Sautter, Lemonnier & Co., Paris. These experiments demonstrated that the forward projector must have a high power, and give a beam suitable to the dimensions of the canal and the positions of the buoys; that it should be placed from 3 to 4 meters above the level of the water, beyond the view of the pilot; that the side and stern lamps should fulfil certain conditions, that they should be easily managed, and that their control should be under the hand of the pilot that he may light or extinguish any or all of them at will.

The foregoing conditions can be easily complied with on all ships fitted with electric light apparatus, and those vessels not so provided, can if they wish, follow the example of the Peninsular and Oriental Company, who have solved the problem for their fleet in the following manner. A complete plant, including dynamos and steam motor, switchboard, projectors, lamps, conductors, etc., is taken on board on entering the canal and discharged on leaving it. Suitable arrangements for making steam connection are of course provided on board. The work of taking this installation on board and discharging it is done very rapidly, so that no delay at either end of the canal is caused.

Digest of U. S. Patents on Storage Batteries.

REFERENCES TO FOREIGN PATENTS OBTAINED THEREON.

1882.

265,861. Oct. 10, 1882. Filed July 13, 1882. English pat. No. 2,391. May 20, 1882.
James Pitkin, London, England.

The electrodes consist of plate-shaped boxes of non-conducting material, the faces of which are formed of louver-like strips or laths of a similar material, or the faces may be perforated with downwardly-inclined holes; the box is filled with lead shaving or comminuted metal—the object of this arrangement being to retain the active material in position, and yet allow free access of the electrolytic liquid.

266,089. Oct. 17, 1882. Filed May 27, 1882.
Charles F. Brush, Cleveland, Ohio.

The electrodes may be formed of a body or core of pure lead or an alloy of lead "upon one or more or all sides of which is welded, or in any equivalent manner attached a substance or mass consisting of small particles of lead having oxidized surfaces welded by pressure into a compact or firmly-coherent body, or else a mechanical mixture of non-oxidized lead particles and oxide of lead welded by pressure into a compact and firmly-coherent body."

266,090. Oct. 17, 1882. Filed June 9, 1881.
Charles F. Brush, Cleveland, Ohio.

The electrodes are formed of plates of rolled or cast-lead, honey-combed or perforated or provided with horizontally-arranged ribs upon the surfaces, or with horizontal shelves, as in the manner of blind slats inclined from the center of the plate downwards and outwards; or thin plates may be corrugated—the object of the various arrangements shown being to further the oxidization of the plates in forming and to more effectually retain the oxides formed in position upon the plates.

226,114. Oct. 17, 1882. Filed March 1, 1882.
A. K. Eaton, Brooklyn, N. Y.

The electrodes consist primarily of a skeleton of lead wire formed as open wicker-work, immersed in a solution of acetate of lead. The lead in solution is deposited upon the wicker-work in a spongy condition. Asbestos or cotton cloth, bibulous paper, etc., may be employed in place of the lead core. Before assembling the plates in separate cells, those intended for the negative element may be peroxidized, or a coating of peroxide of lead may be mechanically applied.

266,262. Oct. 17, 1882. Filed Sept. 18, 1882.
W. A. Shaw, Brooklyn, N. Y.

Relates to electrodes formed as pipes, through which a liquid can be made to flow for the purpose of reducing the temperature of the electrodes when charging; also to an active paste of any of the oxides of lead and sulphur; also to a glazing of nitrate of potash. The electrodes may be strips instead of tubes, and the active or spongy material applied by deposition from a salt, such as the chlorides, sulphates or acetates of lead.

266,763. Oct. 31, 1882. Filed July 20, 1882.
Charles F. Brush, Cleveland, Ohio.

The claim is for the process of manufacturing elements for secondary batteries, consisting in superficially oxydizing particles or separate pieces of lead, and then subjecting them to pressure and uniting into a firmly coherent mass.

267,137. Nov. 7, 1882. Filed July 24, 1882.
Virgil W. Blanchard, N. Y.

Consists of an outer containing vessel of glass, having its bottom provided with upwardly projecting ribs; upon the ribs rest at each end two vessels of lead, one within the other. Numerous perforated tubes are located in the leaden vessels, and around those tubes is packed an active material. The tubes are carried through the leaden vessels, and the electrolytic liquid (sulphuric acid and water) is thus brought in contact with the material.

267,275. Nov. 7, 1882. Filed Sept. 30, 1882.
Eli T. Starr, Philadelphia, Pa.

The electrodes are described as being made from oxide of lead or finely divided lead mixed with plaster of-Paris to a plastic condition, then moulded and allowed to set. The claim is for an element formed by mixing a finely-divided active material with a non-active material, which sets or hardens after being brought to a plastic condition, and without the application of artificial heat.

267,804. Nov. 21, 1882. Filed June 2, 1882.
E. T. Starr, Philadelphia, Pa.

This battery has one of its electrodes (negative) formed of a sheet of lead, and the other (positive) of a conglomeration or mass of porous active material, such as the oxide of lead, contained within a porous envelope. The negative elements receive a coating of peroxide, as in the Plante type, and the lead oxide in the envelope is reduced to a spongy condition by the hydrogen evolved.

267,860. Nov. 21, 1882. Filed June 12, 1882.
Joseph R. Finney, Pittsburgh, Pa.

One form of this battery consists of a containing vessel divided into two compartments by a perforated partition. In one compartment flakey, fibrous or flocculent lead is placed, prepared by pouring molten lead into water, or blowing lead through a falling stream of the same, thus forming the negative electrode. The other compartment is filled with a block of carbon as the positive electrode. The electrolyte used is sulphuric acid and water. Various modifications are described; both electrodes may be of divided lead. The battery may act as a primary battery with the proper exciting solution.

268,174. Nov. 28, 1882. Filed Aug. 31, 1882.
Virgil W. Blanchard, N. Y.

In an oblong semi-circular vessel are arranged a number of plates secured to a longitudinal shaft having its bearing in the ends of the vessel. The plates are hollow, and are adapted to be filled with granular lead. A device is described for passing a current of externally generated oxygen or hydrogen through the battery, and which is said to act on the plates, to chemically alter them and render them capable of storing potential.

268,308. Nov. 28, 1882 Filed Oct. 6, 1882.
E. T. and E. E. Starr, Philadelphia, Pa.

The battery box or case is made air-tight and provided with a false perforated bottom raised somewhat above the bottom of the case. The electrodes are of lead, or one of lead and the other of palladium. They are indented or perforated, and upon which is mechanically applied a paste made from an oxide of lead or an oxide incorporated with a fibrous material such as cotton. On the top of the battery case is arranged an electro-magnetic device, energized by means of the charging current and acting to open a gas vent, and thus allow the escape of the gas generated during the charging. The claims cover three distinct inventions.

I. The battery as a whole.
II. The automatic gas vent.
III. The active paste of oxide and fibrous material.

268,360. Nov. 28, 1882. Filed Apr. 15, 1882.
A. K. Eaton, Brooklyn, N. Y.

Two different varieties of batteries are described. One in which the negative electrode is an amalgamated plate of lead enveloped in a sheathing of cloth or asbestos-board, and the positive electrode of a finely divided metal—such as carbon, packed loosely between metallic plates, suitable connecting strips being provided. The electrolyte may be sulphate of iron, of copper, or of zinc or other metallic salt in solution.

Another in which the negative electrode consists of a metallic support upon which spongy lead is deposited by the electric decomposition of acetate of lead. The positive is the same as in the first form.

Where powdered carbon is used, it is preferably covered by a film of electrically deposited copper.

1883.

270,778. Jan. 16, 1883. Filed June 15, 1882.
Walter K. Freeman, Brooklyn, N. Y.

Two lead plates are secured together to form an electrode, each having a series of circular concave perforated recesses arranged opposite and forming circular pockets adapted be filled with an active material. The electrodes are separated by layers of sponge and held together by rubber bands.

270,884. Jan. 23, 1883. Filed May 24, 1882.
Emile Berliner, Boston, Mass.

Relates to an electrolyte for storage batteries—consisting of a solution of water, acid, and alcohol mixed. The addition of the alcohol is said to facilitate the oxidization of the negative electrode.

271,628 Feb. 6, 1883. Filed Sept. 13, 1882.
Alfred Haid, Rahway, N. J.

Each electrode consists of a rectangular turned iron frame, provided with a number of apertures of square or oblong form and made as large and placed as near together as is possible.

The frame designed for the negative element is filled with oxide of lead or suitable lead compound. The frame for the positive element is filled with a compound of spongy Prussian blue. When the battery is charged, per oxide of lead is formed on negative element, and the Prussian blue of the positive element is reduced to a bluish-white compound containing less oxygen than before, but having a great affinity for oxygen.

ELECTRIC LIGHT NEWS

—— The Altoona incandescent electric light company is having engine and boiler buildings constructed.

—— The Messrs. Simons Bros. have introduced the electric light in their large silk mill at Union Hill, N. J.

—— The King Electric Light Company, Chicago, Ill. Capital stock, $30,000. Incorporators, Edgar C. King, Edward A. Brain, and Robert H. Byers.

—— The suburbs of the city of Oswego are to be lighted by electricity, this illuminant having given so much satisfaction to the business portion of the city.

—— Selma, Ala., is greatly pleased with her new electric lights. The press of that city are particularly jubilant, and everybody, except envious neighboring towns, seems to be happy.

—— The Ball Electric Light Company, of 63 Equitable Building, Boston, have just installed a 25-light plant in Portsmouth, N. H., to the great satisfaction of the people of that nice old town.

—— The New York Knitting Company has purchased the watch factory at Marion, N. J., which has been closed for several years. The building is to be enlarged, and is to be illuminated throughout by electricity.

—— The Troy (N. Y.) Electric Light Company has purchased 70 of the Brady mast arms, manufactured in New Britain. These mast arms are being used quite extensively by electric light companies.

—— A committee of the Paris Polytechnic institute has reported favorably on Sig. Tomasini's method of electric photography—*i. e.*, a plan for superseding the functions of light by the direct action of electric currents, and obtaining photographs in the dark.

—— The Schuyler Electric Light Company, of Wichita, Kan., started on May 1st with only 12 lights, but they have gradually increased this number until it is now over 140, and orders for new lights are coming in daily, so that the company have recently ordered a new boiler and engine to meet the demand.

—— The Brush arc light has recently been introduced into the Arlington Mills at Wilmington, Del. The establishment is the first in that city to use the Brush light, but its use will now probably be extended. The mills are working very satisfactorily under their new management, both to employers and employed.

—— In the construction of their new building, since their loss by fire, Messrs. Jones & Bro., electricians, of Cincinnati, have made admirable arrangements for securing accurate tests. Their instruments of precision are placed on solid stone foundations built from the ground up independent of the building, so that no jarring or foreign influence can interfere with the tests.

—— The Orange Electric Light and Power Company have filed articles of incorporation in the County Clerk's office. The company will start with a capital of $100,000. The incorporators are George A. Halsey, Henry C. Kelsey, Henry Powles, Charles A. Lighthipe, and John L. Blake. Business will be conducted in Orange, East, West, and South Orange.

—— The Minnesota Brush Electric Company, T. S King, general manager, has captured the entire Minnesota Exposition electric lighting contract, which will require at least 150 arc lamps and 600 incandescent. This is an important contract, as the new exposition building is to be the finest in the West, and the company securing the work will see that everything is done in first-class style.

—— The park commissioners of Allegheny City have directed the Allegheny County Electric Light Company, to whom the contract for the lights was awarded by Councils, to erect the lights for the parks, upon masts or poles sixty feet high.

—— A secondary element of iron and lead in a concentrated solution of lead nitrate has been devised by Herr Kalischer, in which the iron electrode is passive, and with currents not too strong becomes coated with coherent thick layers of black peroxide of lead, which protect the iron from contact with the liquid and from decomposition. The change is completed when gas is liberated at the anode, and the liquid gives only a slight precipitate with sulphuric acid. To prevent lead growths between anode and cathode, amalgamated lead in contact with mercury is used. In discharging, the peroxide becomes brown and changes into monoxide, then into black peroxide. The electro-motive force is from 2 to 2¼ volts, but is reduced when the current stops to 1.8 volts. From its solubility in nitric acid the lead cathode must be occasionally replaced. Carbon can be used instead of iron.

—— The Ball Electric Light Company was recently organized in New York with a capital of $2,000,000. Its officers are: Dewitt C. Wheeler, president; Latimer E. Jones, vice-president; C. P. Whitney, secretary and treasurer (late secretary Brush-Swan Electric Light Company); Royal E. Ball, electrician, and Chas. E. Ball, mechanical manager. Main office, 160, 162 and 164 Broadway. Its trustees are Dewitt C. Wheeler; Latimer E. Jones, wholesale lumber merchant, New York; John Straiton, late Straiton & Storm, New York; Chas. E. Ball, electrician, New York; David J. Yuengling, Jr., Yuengling's Brewery, New York; Thos. S. Acheson, New York Lumber Auction Company; Jas. H. Breslin, proprietor Gilsey House, New York; John Cecil, capitalist, New York; Wm. S. Hopkins, president First National Bank, St. Clair, Mich; H. W. Spang, president Ball Electric Manufacturing Company (limited), Reading, Penn., and Jas. H. Clark, New York. Its president, Mr. Wheeler, is well known, while its board of trustees embraces some of the most successful and energetic business men. The new company has already closed a number of good contracts, and its outlook is very promising. The large building at Ninth avenue and Twenty-seventh street, New York, formerly occupied by the Ninth Avenue Omnibus Company, is being fitted up, and will shortly be occupied by the Ball company for the manufacture of its dynamos and lamps. The Ball system of electric lighting is getting a fair share of business, and its exploiters, Messrs. Ball & Spang, deserve great credit for their success in handling it during the past three years of great depression.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 6, 1886.

344,772 Siphon recorder; Charles Cuttriss, New York, N. Y.
344,801 Dynamo-electric machine; Wallace E. Freeman, Astoria, N. Y.
344,802 Arc light; Wallace E. Freeman, Astoria N. Y.
344,818 Induction coil; Daniel Drawbaugh, Eberly's Mill, Pa., assignor to the People's Telephone Company, New York, N. Y.
344,827 Underground conductor for electric wires; John Grant, Omaha, Neb.
344,843 Underground conduit; Ranald Macdonald, Brooklyn, N. Y.
344,882 Composition for electrodes for secondary batteries; Sylvanus L. Trippe, Denver, Col.
344,938 Telephone; Sigmund Bergmann. New York, N. Y;
344,940 Electric bell; Elliott Carhart, Brooklyn, N. Y.
344,946 Galvanic battery; George F. de Solome, New York, N. Y., assignor to J. Seaver Page, same place.
344,947 Connection for galvanic batteries; Geo. F. de Solome. New York, N. Y., assignor to J. Seaver Page, same place.
344,948 Automatic means for opening and closing electric circuits; George F. de Solome, New York, N. Y., assignor to J. Seaver Page, same place.
344,957 Secondary battery or accumulator; Stephen Farbaky and Stephen Schenck, Schemnitz, Austria-Hungary.
344,962 Electric subway; Robert L. Harris, Brooklyn, N. Y.
344,963 Telephone; Arthur M. Phelps, Seabrook, Md.
345,008 Incandescent lamp and connections; Jean T. Van Gestel, Hartford, Conn.
345,084 Method of transmitting and receiving articulate sounds to distant points; Edward S. Spaulding, New York, N. Y.
345,085 Apparatus for transmitting to distant points articulate sounds; Edward S. Spaulding, New York, N. Y.
345,124 Secondary battery; Alexandre Lebrunde Virloy, Edmond Commelin and Gabriel Bailhache, Paris, France, assignors of one-fourth to Leopold de Bousignac, same place.
345,178 Electric chain battery; Robert N. Rockwell, Peabody, Kansas.
345,209 Contact finger for vibrating reeds; Robert G. Brown, Brooklyn, assignor to the Standard Multiplex Telegraph Company, New York, N. Y.
345,212 System of electrical distribution; Henry M. Byllesby, Roselle, N. J., assignor to Geo. Westinghouse, Jr., Pittsburgh, Pa.
345,245 Printing telegraph receiver; Henry Mahnken, New York, N. Y.

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Electric Light Companies and Manufacturers of Electric Light Apparatus, Supplies, &c., desiring to become members, must apply on or before August 31st, to the President, J. F. MORRISON, Baltimore, Md.

Members and others desiring information as to R.R. transportation rates will address J. F. NOONAN, Esq., Chairman Com. on Transportation, Paterson, N. J.

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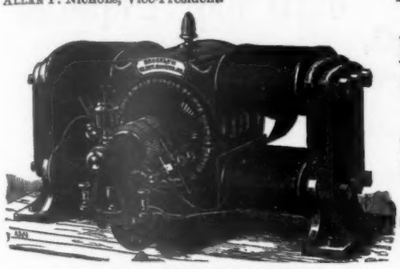

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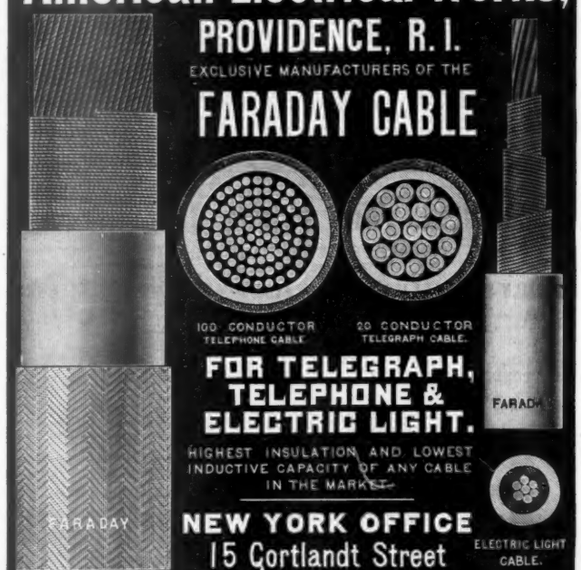

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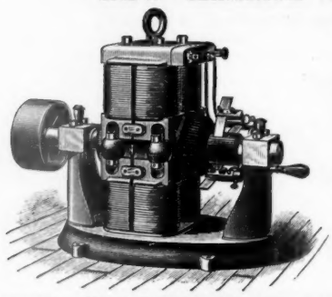

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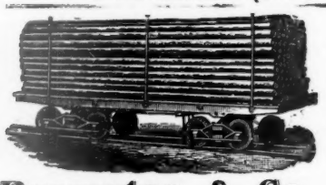

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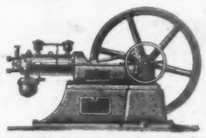

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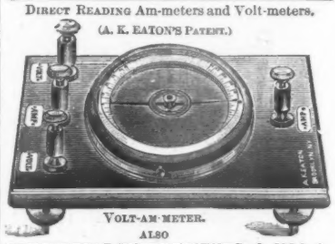

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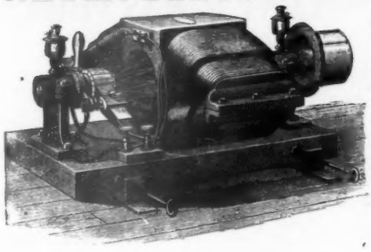

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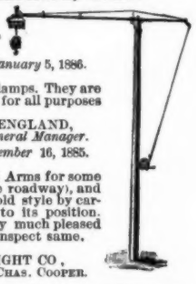

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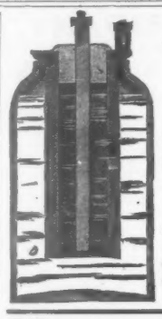

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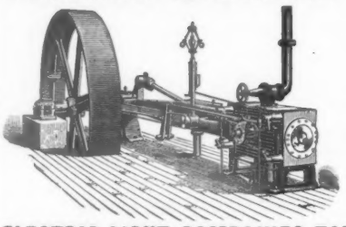

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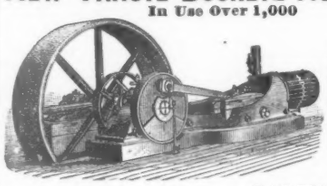

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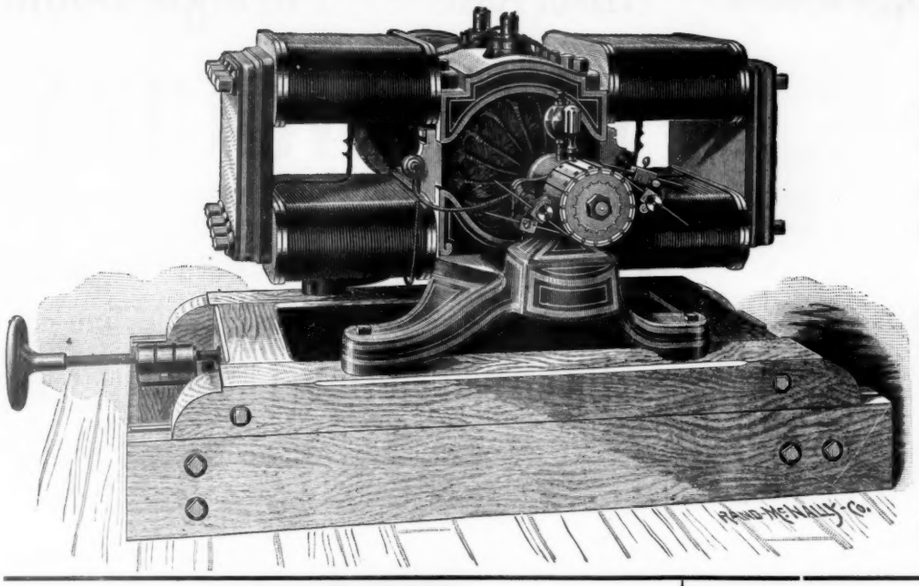

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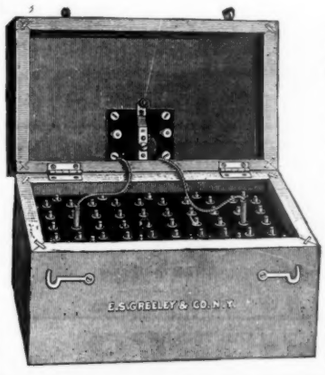

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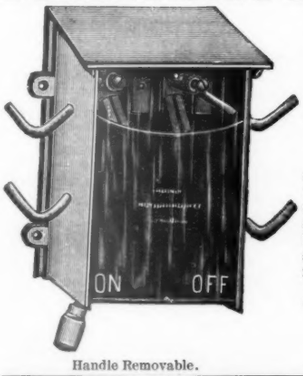

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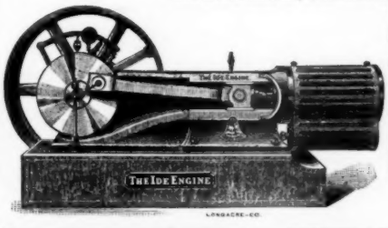

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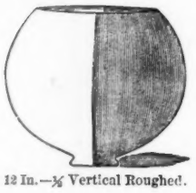

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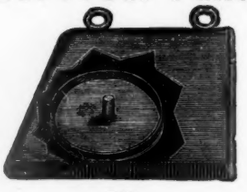

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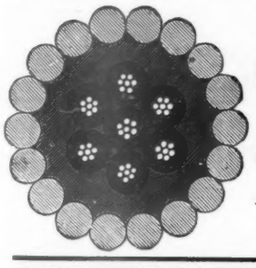

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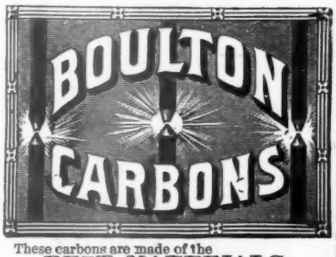

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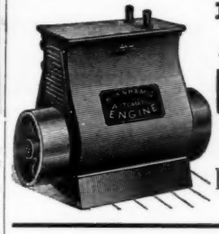

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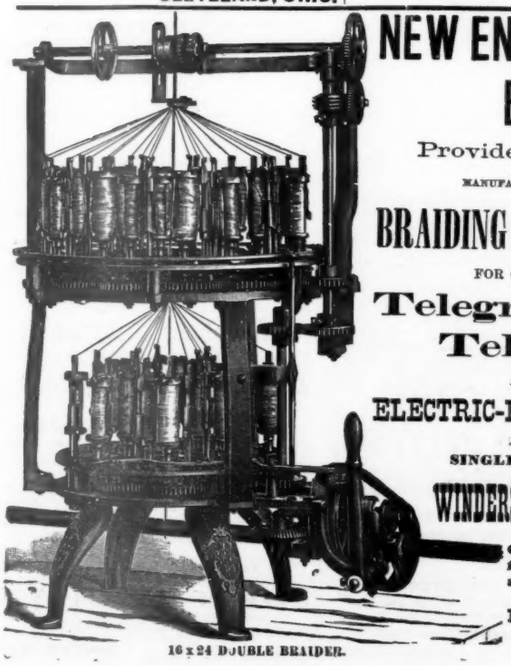

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